Appendix D
Additional Information to Support Resource Analyses

Appendix D

Appendix D

D.1 ADDITIONAL ANALYSES FOR THE FOREST STRUCTURE AND VEGETATION SECTION

D.1.1 Site Class

Site class indicates the productivity of an area to grow a given species of tree. Site class is based on site index, which is the expected height of a dominant tree at a specific index age (generally a 50 years breast-height age). Site Class I represents the highest productivity and Site Class V the lowest. Site class is a factor in determining the biological productivity and economic potential of a stand and will influence the frequency of harvest of a stand.

Table D-1 displays site class acres in each of DNR's planning units in western Washington. Site class is predominantly moderate to high on state trust land in western Washington. Four percent of these lands are highly productive Site Class I. Site Class II covers 30 percent of the westside trust lands. Site Class III covers approximately 44 percent of the trust lands. Site Class IV and Site Class V are found on 18 and 5 percent of the area, respectively.

Table D-1. Site Class for Western Washington Forested Trust Lands, by Planning Unit

	Site Class									
	I		II		III		IV		V	
Planning Unit	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Straits	410	<1%	10,456	10%	62,396	57%	32,864	30%	4,095	4%
North Puget	15,506	4%	95,098	25%	152,355	40%	75,936	20%	42,621	11%
South Puget	1,580	1%	31,653	22%	69,255	49%	34,950	25%	4,405	3%
Columbia	9,275	4%	98,741	37%	102,651	38%	48,564	18%	8,299	3%
South Coast	23,844	10%	138,845	60%	64,177	26%	4,540	2%	1,526	1%
OESF	3,076	1%	36,689	14%	156,259	61%	52,940	21%	7,694	3%
Total Acres	**53,690**	**4%**	**411,483**	**30%**	**607,094**	**44%**	**249,794**	**18%**	**68,641**	**5%**

Data Source: Model output data – SDS. Some percentages do not sum to 100 due to rounding.
OESF = Olympic Experimental State Forest

The North Puget, South Coast, and Columbia planning units contain the most productive forest sites. These three units contain over 90 percent of Site Class I lands and 80 percent of Site Class II lands in the westside trust lands. Site Class III occurs on 10 to 25 percent of the forestland in each planning unit. More than 60 percent of Site Class V lands are in the North Puget Planning Unit.

D.1.2 Harvest Intensity

Figures D-1, D-2, and D-3 graphically display the variations in distribution of management intensity by land class that would result from differing policy and procedures among Alternatives. Harvest intensity under Alternative 1 would be low in all land classes when compared to other alternatives because of constraints that reduce the land base for harvest. Under Alternative 4, harvest intensity would be similar to Alternative 1, reflecting the

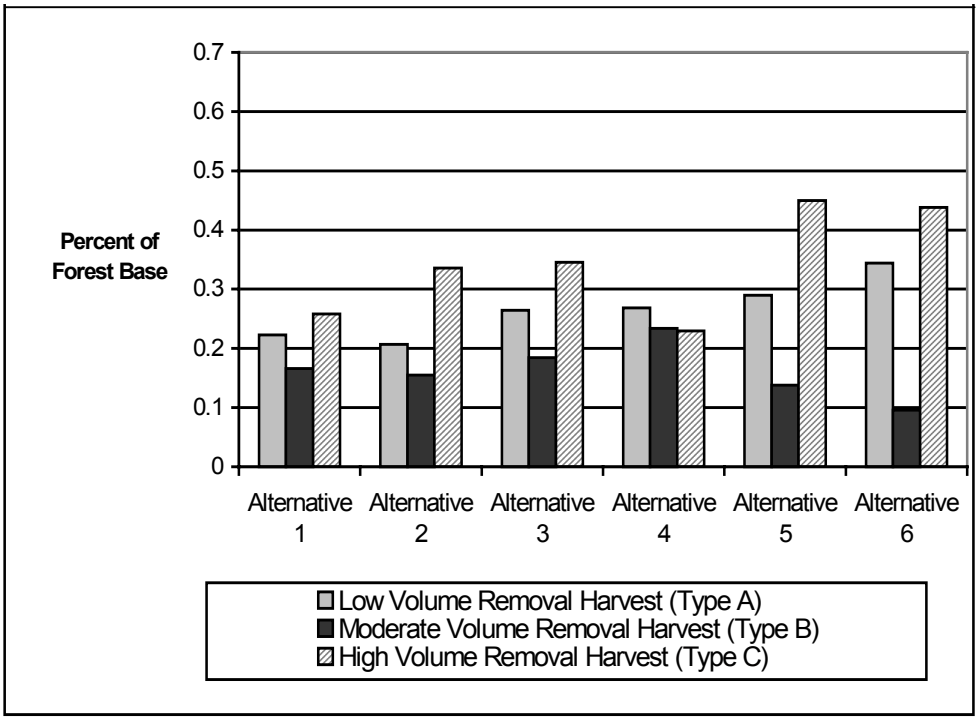

Figure D-1. Harvest Intensity in Forested Trust Lands with General Management Objectives Land Class (annual average percent of total forest base area by harvest type over the analysis period)
Data Source: Model output data (Timber Flow Level)

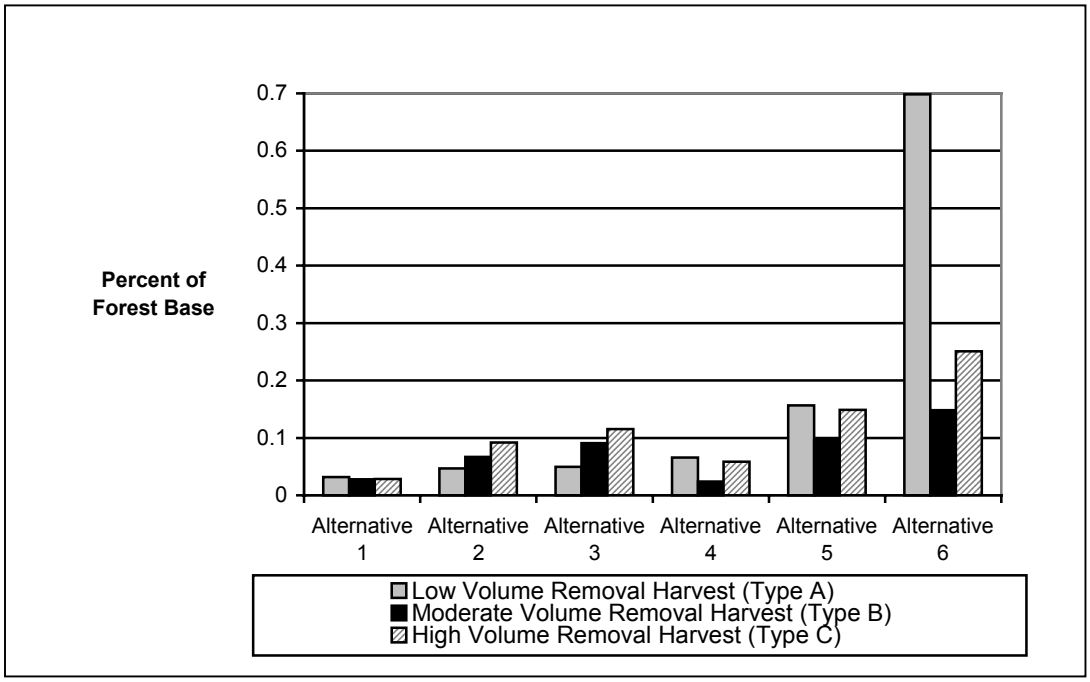

Figure D-2. Harvest Intensity in Forest Trust Lands with Specific Location Management Objectives Land Class (annual average percent of total forest base area by harvest type over the analysis period)
Data Source: Model output data (Timber Flow Level)

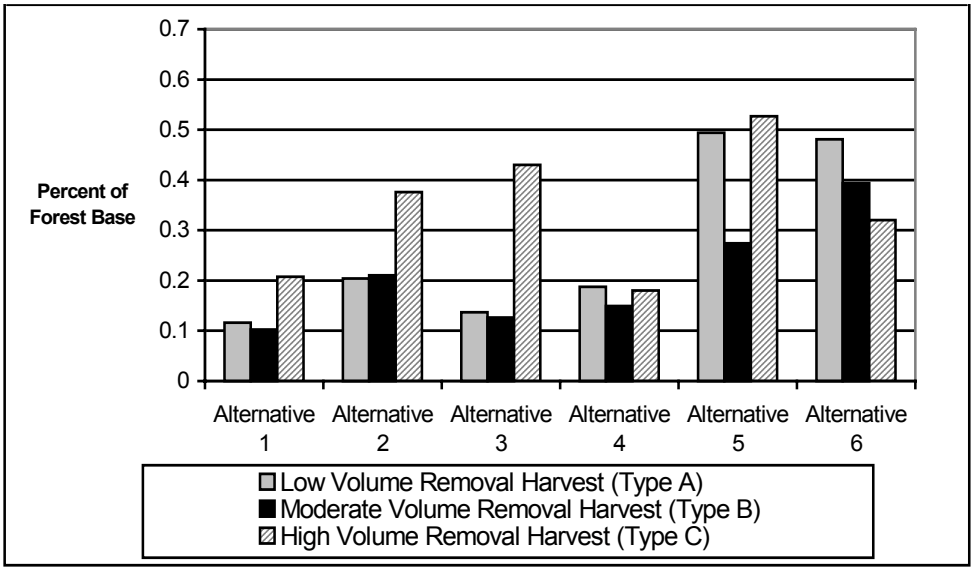

Figure D-3. Harvest Intensity on Trust Lands in the Riparian Land Class (annual average percent of total forest base area by harvest type over the analysis period)
Data Source: Model output data (Timber Flow Level)

combination of harvest constraints in riparian areas and proposed longer harvest maturity criteria. Alternatives 2, 3, 5, and 6 would have higher harvest intensity. Some lands that currently have harvest restrictions would be available for harvest under these four alternatives through policy change and increased commitment of resources. Under Alternative 5, a younger maturity criterion (50 years) would increase harvest intensity over Alternatives 1, 2, 3, and 4. Under Alternative 6, the combination of managing some lands with economic objectives and multiple entries associated with biodiversity pathways management to enhance wildlife and riparian habitat would result in the highest level of harvest intensity among the alternatives.

Figure D-4 displays harvest type (low, moderate, and high volume removal) over time by alternative, expressed as a percent of the total DNR Westside trust lands. The figure graphically displays lower harvest intensity in Alternatives 1 and 4 that would use passive management strategies compared to Alternatives 5 and 6, and, to a lesser extent, Alternative 3. Under Alternative 3, harvest intensity would show more variability over time because of the wider allowable fluctuation in decadal harvest targets. The intensive management strategy proposed under Alternatives 5 and 6 would result in higher harvest intensity levels, partly due to higher amounts of thinning. Under Alternative 6, biodiversity pathways management would entail multiple harvest entries to encourage the development of stand structure needed for wildlife habitat and riparian structure.

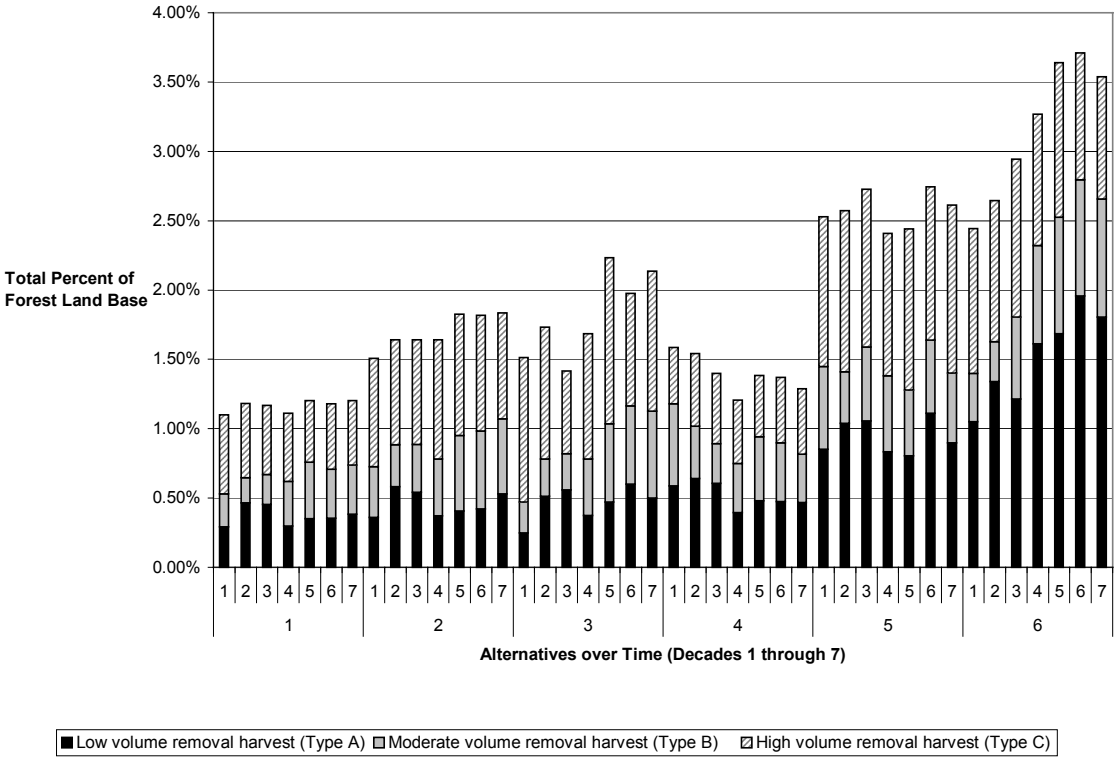

Figure D-4. Harvest Intensity by Alternative (average annual percent of Westside Trust Lands by harvest type)
Data Source: Model output data (Timber Flow Level)

Harvest intensity viewed at the planning unit level shows a similar pattern, with the following exceptions (Tables D-2 and D-3). The Olympic Experimental State Forest Planning Unit (OESF) would consistently have lower harvest levels than the other planning units in Alternatives 1, 2, 3 and 4. Under Alternatives 5 and 6, there is an increased percentage of low volume removal harvest in the OESF. In Alternatives 1, 2, 3, and 4, South Coast Planning Unit would have a slightly higher harvest intensity than the other planning units.

Table D-2. Harvest Intensity by Planning Unit for Westside Trust Lands

		Average Annual Percent of Planning Unit Area Affected		
Alternative	**Planning Unit**	**Low Volume Removal Harvest (Harvest Type A)**	**Moderate Volume Removal Harvest (Harvest Type B)**	**High Volume Removal Harvest (Harvest Type C)**
1	Columbia	0.5%	0.4%	0.6%
	North Puget	0.4%	0.3%	0.6%
	OESF[1/]	<0.1%	0.1%	0.2%
	South Coast	0.5%	0.4%	0.6%
	South Puget	0.5%	0.4%	0.6%
	Straits	0.3%	0.2%	0.3%
2	Columbia	0.5%	0.4%	0.9%
	North Puget	0.6%	0.5%	0.7%
	OESF	0.2%	0.1%	0.7%
	South Coast	0.6%	0.6%	1.0%
	South Puget	0.4%	0.5%	0.8%
	Straits	0.5%	0.6%	0.8%
3	Columbia	0.6%	0.5%	1.0%
	North Puget	0.5%	0.4%	0.8%
	OESF	0.1%	0.2%	0.9%
	South Coast	0.6%	0.6%	1.0%
	South Puget	0.3%	0.3%	1.0%
	Straits	0.6%	0.6%	1.1%
4	Columbia	0.6%	0.5%	0.6%
	North Puget	0.6%	0.4%	0.5%
	OESF	0.1%	0.1%	<0.1%
	South Coast	0.7%	0.6%	0.7%
	South Puget	0.5%	0.4%	0.4%
	Straits	0.8%	0.8%	0.5%
5	Columbia	0.8%	0.5%	1.2%
	North Puget	0.8%	0.5%	1.0%
	OESF	1.3%	0.3%	1.2%
	South Coast	0.7%	0.6%	1.2%
	South Puget	0.9%	0.6%	0.9%
	Straits	1.0%	0.6%	1.1%
6	Columbia	1.4%	0.8%	1.3%
	North Puget	1.2%	0.6%	1.0%
	OESF	3.0%	0.6%	0.2%
	South Coast	0.8%	0.6%	1.6%
	South Puget	1.5%	0.9%	0.8%
	Straits	1.0%	0.5%	1.3%

[1/] OESF = Olympic Experimental State Forest
Data Source: Model output data (Timber Flow Level)

Appendix D

Table D-3. Summary of Management Intensity for DNR Planning Units by Alternative

	Decadal Average of Acres Harvested by Type of Harvest (Volume of Harvest Removed)			
Alternative 1				
Planning Unit	**A[1/]**	**B[2/]**	**C[3/]**	**All types**
Columbia	12,783	10,016	16,580	39,379
North Puget	15,521	11,166	20,175	46,862
Olympic Experimental State Forest	1,276	1,736	5,252	8,264
South Coast	11,453	9,367	14,347	35,167
South Puget	7,281	5,356	9,056	21,693
Straits	3,107	2,850	4,101	10,059
Grand Total	**51,421**	**40,492**	**69,511**	**161,424**
Alternative 2				
Planning Unit	**A**	**B**	**C**	**All types**
Columbia	11,941	10,814	24,073	46,828
North Puget	21,403	17,643	27,607	66,653
Olympic Experimental State Forest	4,478	3,595	17,757	25,830
South Coast	13,529	14,224	23,144	50,897
South Puget	6,268	6,489	10,895	23,652
Straits	5,273	6,938	8,739	20,950
Grand Total	**62,892**	**59,702**	**112,215**	**234,809**
Alternative 3				
Planning Unit	**A**	**B**	**C**	**All types**
Columbia	14,673	12,327	26,823	53,823
North Puget	20,746	13,846	30,552	65,144
Olympic Experimental State Forest	2,636	5,075	22,291	30,003
South Coast	14,863	13,470	24,007	52,340
South Puget	4,854	4,518	12,836	22,208
Straits	6,633	5,915	11,802	24,350
Grand Total	**64,406**	**55,151**	**128,311**	**247,868**
Alternative 4				
Planning Unit	**A**	**B**	**C**	**All types**
Columbia	15,701	13,413	15,284	44,398
North Puget	23,394	14,573	20,497	58,464
Olympic Experimental State Forest	1,568	2,152	896	4,616
South Coast	17,085	13,906	17,119	48,109
South Puget	7,028	5,833	5,420	18,281
Straits	8,479	7,423	5,868	21,770
Grand Total	**73,255**	**57,299**	**65,083**	**195,637**
Alternative 5				
Planning Unit	**A**	**B**	**C**	**All types**
Columbia	22,869	13,493	32,468	68,831
North Puget	30,434	18,231	36,153	84,818
Olympic Experimental State Forest	36,510	8,149	31,011	75,670
South Coast	17,144	14,743	29,086	60,973
South Puget	13,940	8,543	14,472	36,955
Straits	10,694	7,540	12,230	30,463
Grand Total	**131,591**	**70,699**	**155,421**	**357,710**

Table D-3. Summary of Management Intensity for Planning Units by Alternative (continued)

	Decadal Average of Acres Harvested by Type of Harvest (Volume of Harvest Removed)			
Alternative 6				
Planning Unit	**A**	**B**	**C**	**All types**
Columbia	37,401	19,369	33,453	90,223
North Puget	43,729	20,260	38,837	102,826
Olympic Experimental State Forest	76,696	15,640	5,267	97,602
South Coast	19,055	12,421	37,682	69,157
South Puget	20,412	12,777	12,326	45,515
Straits	10,930	5,374	14,421	30,726
Grand Total	**208,222**	**85,842**	**141,987**	**436,050**

Data Source: Model output data – TFL
[1/] Type A removes up to 11 thousand board feet/acre
[2/] Type B removes 11-20 thousand board feet/acre
[3/] Type C removes more than 20 thousand board feet /acre

Appendix D

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D.2 ADDITIONAL DATA FOR THREATENED, ENDANGERED, AND SENSITIVE PLANTS

Table D-4 provides detailed information on Washington threatened, endangered, and sensitive vascular plants.

Appendix D

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Table D-4. Washington Threatened, Endangered, and Sensitive Vascular Plants for Counties with DNR State Trust Lands - 2003

Species	State Rank	Global Rank	New state status	US ESA status	No. of WAUs with recorded occurrences	Habitat
Habitats May Occur in Harvestable Forests						
Botrychium pedunculosum	S2S3	G2G3	S	SC		Mesic to moist meadows or forests
Chrysolepis chrysophylla	S2	G5	S		7	Dry, open to thick wooded areas
Cimicifuga elata	S3	G3	S	SC	49	Moist, shady woods, lower elevation
Claytonia lanceolata var pacifica	S1S2	G5T3	T			Foothills to alpine
Coptis aspleniifolia	S2	G4G5	S			Moist coniferous forests
Cypripedium fasciculatum	S3	G4	S	SC		Coniferous forest
Euonymus occidentalis	S1	G5	T		5	Woods
Lathyrus torreyi	S1	G5	T	SC	6	Mixed conifer forest
Pityopus californica	S1	G4G5	T			Deep coniferous forests
Platanthera obtusata	S2	G5	S			Damp to wet forests
Viola renifolia	S2	G5	S			Lowland forest to subalpine slopes
May Occur in Areas Adjacent to or Within Harvestable Forests						
Agoseris elata	S3	G4	S		5	Meadows, open woods
Arenaria paludicola	SX	G1	X	LE	1	Wetlands, freshwater marshes at low elevations
Botrychium ascendens	S2S3	G2G3?	S	SC		Mid - upper elevations, ridges and meadows
Campanula lasiocarpa	S2	G5	S			Rock crevices in alpine
Carex comosa	S2	G5	S		10	Marshes, lake margins, wet meadows, other wet places
Carex densa	S1	G5	T			Eroding hummocks in marshland
Carex flava	S3	G5	S			Wet places
Carex magellanica ssp irrigua	S2S3	G5T5	S		3	Bogs, fens, wet meadows
Carex pauciflora	S2	G5	S		10	Sphagnum bogs
Carex pluriflora	S1S2	G4	S		1	Boggy lake margins, streambanks, saturated areas
Carex scirpoidea var scirpoidea	S2	G5T4T5	S			Moist meadows, rock outcrops, near and above timberline
Carex stylosa	S1S2	G5	S		10	Spagnum peat or sloping wetlands with surface seepage
Cassiope lycopodioides	S1	G4	T		2	Occurs in AK; here found on cliffs, cold deep ravine
Castilleja cryptantha	S2S3	G2G3	S	SC		Subalpine meadows; endemic to Mt. Ranier National Park
Castilleja levisecta	S1	G1	E	ST	13	grasslands
Cicuta bulbifera	S2	G5	S			Wet places or standing water
Cochlearia officinalis	S1S2	G5	S		3	Coastal beaches
Collinsia sparsiflora var bruceae	S1S2	G4T4	S			Open slopes and swales
Corydalis aquae-gelidae	S2S3	G3	S	SC	2	Creeks and seeps above 2,500 ft.
Crassula connata	S1S2	G5	T			Open areas
Cyperus bipartitus	S2	G5	S			Streambanks, wet low places
Delphinium leucophaeum	S1	G2Q	E			Lowland praries
Dryas drummondii	S2	G5	S			Cliff crevices, talus, rocky ridges
Erigeron aliceae	S2	G4	S		1	Meadows, openings in woods
Erigeron howellii	S2	G2	T	SC	5	Non-forested areas
Erigeron oreganus	S2	G3	T	SC		Exposed basalt
Erigeron peregrinus ssp peregrinus var	S2	G5T2	S			Bogs
Eryngium petiolatum	S1	G4	T			Areas submerged in spring, dry late summer
Erythronium revolutum	S3	G4	S		50	Along streams and edges of bogs
Filipendula occidentalis	S2S3	G2G3	T	SC	8	Riparian areas
Fritillaria camschatcensis	S2	G5	S		3	Moist to wet meadows, riparian
Gaultheria hispidula	S2	G5	S			Bogs
Gentiana douglasiana	S2S3	G4	S		4	Bogs
Githopsis specularioides	S3	G5	S		2	Dry, open areas
Hedysarum occidentale	S1	G5	S			Open areas with dry, rocky soils
Howellia aquatilis	S2S3	G3	T	LT		Shallow ponds in lowland forested areas
Hydrocotyle ranunculoides	S2	G5	S			Marshes and wet ground
Hypericum majus	S2	G5	S		3	Wet ground
Isoetes nuttallii	S1	G4?	S		1	Terrestrial in wet ground or seeps and mud near vernal pools
Lathyrus holochlorus	S1	G3	E			Forest borders and openings
Liparis loeselii	S1	G5	E			Springs, bogs, wet sunny places
Lobelia dortmanna	S2S3	G4	T		14	Shallow water at lake margins
Loiseleuria procumbens	S1	G5	T			Moist meadow
Lomatium bradshawii	S1	G2	E	LE		Moist to wet meadows
Lycopodiella inundata	S2	G5	S		1	Sphagnum bogs
Lycopodium dendroideum	S2	G5	S			Dry rocky slopes and open coniferous forests
Meconella oregana	S2	G3?	T	SC		Grasslands and savannahs
Microseris borealis	S2	G4?	S			Sphagnum bogs and wet to moist meadows
Montia diffusa	S2S3	G4	S		5	Moist woods at lower elevation

Table D-4. Washington Threatened, Endangered, and Sensitive Vascular Plants for Counties with DNR State Trust Lands - 2003 (continued)

Species	State Rank	Global Rank	New state status	US ESA status	No. of WAUs with recorded occurrences	Habitat
Ophioglossum pusillum	S1S2	G5	T		13	Mesic to moist meadows in low to subalpine
Orthocarpus bracteosus	S1	G3?	E		8	Moist meadows
Oxalis suksdorfii	S1	G4	T		2	Moist coastal woods to dry open slopes
Parnassia fimbriata var hoodiana	S1	G4T3	T			Streambanks, bogs,wet meadows
Parnassia palustris var neogaea	S2	G4T4	S		6	Shaded areas in mountains to alpine
Platanthera chorisiana	S2	G3	T		1	Wet meadows, rocky seeps, lake shores
Platanthera sparsiflora	S1	G4G5	T			Moist to wet or boggy areas
Poa laxiflora	S1S2	G3	T		1	Moist woods to rocky slopes
Poa nervosa	S2	G3?	S			Montaine
Polemonium carneum	S1S2	G4	T		49	Thickets, woodland, forest openings
Polystichum californicum	S1S2	G4	S		1	Woods, streambanks, open rocky places
Ranunculus populago	S2	G4	S			Wet montaine areas
Ribes oxyacanthoides ssp irriguum	S2	G5T3T4	S		1	Prairie and lower mountains
Rorippa columbiae	S1S2	G3	E	SC		Moist to marshy places
Rotala ramosior	S1	G5	T			Wet places
Salix sessilifolia	S2	G4	S		4	Streambanks
Samolus parviflorus	S1	G5	S			Moist sites
Sidalcea hirtipes	S1	G2	E		11	Prairies, openings along drainages
Sidalcea malviflora ssp virgata	S1	G5T?	E			Prairie, grassland
Sidalcea nelsoniana	S1	G2	E	LT		Moist meadows
Sisyrinchium sarmentosum	S1S2	G1G2	T	SC		Meadows
Sparganium fluctuans	S1	G5	T			aquatic or marshy areas
Spiranthes porrifolia	S2	G4	S			Wet meadows, stream banks, seepage slopes
Synthyris pinnatifida var lanuginosa	S2	G4T2	T			Olympic Mountains
Trillium parviflorum	S2S3	G2G3	S		8	Moist areas dominated by hardwoods
Utricularia intermedia	S2	G5	S		1	Shallow ponds, slow-moving streams, high elevation
Woodwardia fimbriata	S2	G5	S		22	Streambanks and wet places
Habitats are in Non-Forested Areas not Likely to be Adjacent to Harvestable Forests						
Abronia umbellata	SX	G4G5T1	X	SC	9	Sandy beach
Aster borealis	S1	G5	T			Prairie
Aster curtus	S3	G3	S	SC	4	Lowland praries
Aster sibiricus var meritus	S1S2	G5T5	S			Unstable, rocky or gravelly substrate
Astragalus australis var olympicus	S2	G5T2	T	SC		Talus slopes, ridges, and knolls of calcareous substrates
Astragalus microcystis	S2	G5	S			Dry, gravelly soils in alpine; Olympic Mnts
Bolandra oregana	S2	G3	S		6	Moist, shady cliffs, rock outcrops
Carex anthoxanthea	S1	G5	S			Subalpine at seepage sites
Carex circinata	S1	G4	S			rock outcrops at high elevations
Carex macrochaeta	S1	G5	T			Seepage areas and around waterfalls
Carex obtusata	S2	G5	S			Grassy places to high mountains
Chaenactis thompsonii	S2S3	G2G3	S			Serpentine slopes; subalpine slopes
Draba aurea	S2	G5	S			Alpine,sunny rock crevasses
Draba cana	S1S2	G5	S			Subalpine to alpine, rock crevices
Draba longipes	S1	G4	T			Rocky, alpine slopes
Dodecatheon austrofrigidum	S1	G2	E			S. Olympics
Gentiana glauca	S2S3	G4G5	S			Dry to moist alpine meadows
Hackelia cinerea	S1	G4?	S			Cliffs, talus slopes
Hackelia diffusa var diffusa	S2	G4T3	T			Cliffs, talus slopes
Lepidium oxycarpum	S1	G4	T		2	fields, vernal pools, alkaline flats
Lupinus sulphureus var kincaidii	S1	G5T2	E	SL		Lowland praries
Luzula arcuata	S1	G5	S			Rocky or gravelly soil; above timberline or moraines
Nymphaea tetragona	SH	G5	X		3	Water
Oxytropis borealis var viscida	S1S2	G5T4?	S			Mid to high elevation, meadows to alpine
Pedicularis rainierensis	S2S3	G2G3	S			Mt Rainier area
Pellaea breweri	S2	G5	S			Rocky places, crevaces or talus
Penstemon barrettiae	S2	G2	T	SC		Exposed basalt
Plantago macrocarpa	S2	G4	S		5	Cold, wet places; subcoastal
Poa unilateralis	S2	G3	T			Coastal grassy bluffs
Potamogeton obtusifolius	S2	G5	S			Aquatic, submerged
Puccinellia nutkaensis	S2	G4?	S		33	Sea coast
Ranunculus californicus	S1	G5	T			Grassy, coastal bluffs
Ranunculus cooleyae	S1S2	G4	S		2	Damp rocky slopes and rock crevices
Sanguisorba menziesii	S1	G3G4	S			Coastal bogs and marshes

Table D-4. Washington Threatened, Endangered, and Sensitive Vascular Plants for Counties with DNR State Trust Lands - 2003

(continued)

Species	State Rank	Global Rank	New state status	US ESA status	No. of WAUs with recorded occurrences	Habitat
Sanicula arctopoides	S1	G5	E		1	Coastal bluffs
Saxifraga rivularis	S3	G5?	S			Moist crevices, shady rocky areas
Sullivantia oregana	S1	G2	E	SC	2	Exposed rock

State Rank characterizes the relative rarity or endangerment within the state of Washington. Two codes (e.g. S1S2) represents an intermediate rank. S1 = Critically imperiled (5 or fewer occurrences); S2 = Vulnerable to extirpation (6 to 20 occurrences); S3 = Rare or uncommon (21 to 100 occurrences); S4 = Apparently secure, with many occurrences; S5 = Demonstrably secure in state; S H = Historical occurrences only but still expected to occur; SX = Apparently extirpated from the state.

Global Rank characterizes the relative rarity or endangerment of the element world-wide. Two codes (e.g. G1G2) represent an intermediate rank. G1 = Critically imperiled globally (5 or fewer occurrences); G2 = Imperiled globally (6 to 20 occurrences); G3 = Either very rare and local throughout its range or found locally in a restricted range (21 to 100 occurrences); G4 = Apparently secure globally; G5 = Demonstrably secure globally; GH = Of historical occurrence throughout its range; GU = Possibly in peril range-wide but status uncertain; GX = Believed to be extinct throughout former range; G? = Not ranked to date; Tn = Rarity of an infraspecific taxon. Numbers similar to those for Gn ranks above; Q = Questionable.

State Status of the species is determined by the Washington Department of Fish and Wildlife. Factors considered include abundance, occurrence patterns, vulnerability, threats, existing protection, and taxonomic distinctness. Values include: E = Endangered. In danger of becoming extinct or extirpated from Washington; T = Threatened. Likely to become Endangered in Washington; S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state;

US ESA Status under the U.S. Endangered Species Act (USESA) as published in the Federal Register: LE = Listed Endangered. In danger of extinction; LT = Listed Threatened. Likely to become endangered; PE = Proposed Endangered; PT = Proposed Threatened; C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened; SC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but insufficient information to support listing; NL = Not Listed.

Sources: Rankings from WNHP TES Database 2003. Habitats from Hitchcock 1976, WDNR 1999, Sensitive Plants and Noxious Weeds of the Nt. Baker-Snoqualmie National Forest, HCP EIS 1996, University of California and Jepson Herbaria 2003, Pacific Biodiversity Institute 2003, Wisconsin State Herbarium 2003,

Appendix D

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D.3 ADDITIONAL ANALYSES FOR THE RIPARIAN AREAS SECTION

Tables D-5a through D-5f and D-6a through D-6f present detailed riparian data by Alternative.

Appendix D

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Table D-5a. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 1, by Planning Unit and Year

Percent of Riparian Areas - Alternative 1

HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	5.7%	12.3%	17.5%	52.4%	1.2%	0.5%	6.4%	3.4%	0.3%	0.3%
	2008	3.9%	11.1%	15.4%	53.2%	2.3%	0.5%	7.8%	5.2%	0.3%	0.3%
	2013	1.9%	8.6%	15.4%	51.8%	3.5%	0.6%	10.1%	7.4%	0.4%	0.3%
	2031	2.0%	0.8%	11.1%	42.2%	6.2%	0.8%	21.9%	12.9%	1.7%	0.3%
	2048	3.3%	1.3%	4.8%	32.4%	6.3%	0.9%	31.5%	14.9%	4.4%	0.3%
	2067	2.4%	1.2%	4.8%	23.9%	7.3%	1.1%	35.7%	12.2%	11.1%	0.3%
N. Puget	2004	5.4%	13.6%	14.4%	51.0%	5.5%	0.6%	5.5%	3.3%	0.3%	0.3%
	2008	3.5%	12.5%	15.0%	48.6%	7.0%	0.7%	7.6%	4.4%	0.4%	0.3%
	2013	1.8%	8.5%	17.4%	44.7%	8.2%	0.7%	9.5%	8.4%	0.4%	0.3%
	2031	1.7%	1.6%	10.5%	41.7%	8.5%	1.0%	16.8%	16.8%	0.8%	0.5%
	2048	2.6%	1.5%	5.1%	35.9%	9.9%	1.2%	24.6%	16.2%	2.6%	0.5%
	2067	2.4%	1.5%	4.7%	27.1%	11.3%	1.3%	29.3%	14.5%	7.4%	0.5%
OESF	2004	4.6%	25.1%	29.0%	21.0%	1.6%	0.1%	12.8%	4.3%	1.1%	0.3%
	2008	2.6%	20.8%	30.4%	23.8%	2.1%	0.2%	13.6%	5.1%	1.1%	0.3%
	2013	0.9%	11.9%	33.8%	28.5%	2.3%	0.2%	14.4%	6.5%	1.1%	0.3%
	2031	1.6%	0.9%	14.8%	49.7%	3.6%	0.4%	18.3%	8.8%	1.8%	0.3%
	2048	2.0%	1.4%	3.6%	48.3%	5.5%	0.4%	23.4%	12.4%	2.5%	0.4%
	2067	2.0%	1.4%	3.3%	30.3%	5.8%	0.4%	27.5%	23.1%	5.4%	0.8%
S. Coast	2004	4.9%	11.6%	15.5%	55.2%	1.4%	0.3%	6.8%	4.1%	0.1%	0.0%
	2008	2.9%	9.2%	17.9%	51.7%	2.6%	0.4%	8.3%	6.9%	0.1%	0.0%
	2013	1.6%	5.5%	19.3%	48.8%	3.5%	0.4%	11.2%	9.5%	0.3%	0.0%
	2031	1.8%	0.8%	5.7%	44.2%	4.6%	0.7%	22.4%	17.1%	2.7%	0.0%
	2048	3.4%	1.1%	4.2%	29.6%	6.0%	0.7%	31.0%	16.4%	7.6%	0.0%
	2067	2.3%	1.5%	5.6%	20.5%	6.4%	1.0%	34.1%	13.2%	15.4%	0.0%
S. Puget	2004	5.6%	12.9%	16.7%	55.1%	1.4%	1.0%	3.8%	3.5%	0.1%	0.0%
	2008	2.3%	14.0%	15.5%	55.4%	2.3%	1.0%	4.8%	4.3%	0.3%	0.0%
	2013	1.8%	8.7%	18.2%	53.0%	3.7%	1.1%	6.7%	6.4%	0.5%	0.0%
	2031	2.0%	1.6%	10.3%	49.7%	6.2%	1.5%	17.1%	10.7%	0.9%	0.0%
	2048	3.2%	1.3%	4.0%	42.4%	6.5%	1.9%	24.5%	14.2%	2.0%	0.0%
	2067	2.7%	1.8%	3.9%	32.3%	7.2%	2.1%	33.4%	10.8%	5.8%	0.0%
Straits	2004	5.4%	12.9%	9.9%	65.1%	2.2%	0.9%	2.2%	1.5%	0.0%	0.0%
	2008	4.0%	11.0%	12.1%	63.8%	3.5%	0.9%	2.7%	2.0%	0.0%	0.0%
	2013	2.2%	9.1%	13.9%	61.6%	4.7%	1.0%	3.6%	3.9%	0.0%	0.0%
	2031	1.2%	1.3%	12.0%	54.6%	6.6%	1.3%	13.4%	9.5%	0.1%	0.0%
	2048	1.5%	1.5%	3.8%	50.4%	7.6%	1.6%	23.0%	9.5%	0.9%	0.0%
	2067	2.2%	1.2%	3.8%	39.2%	8.8%	1.6%	32.3%	8.5%	2.4%	0.0%
Westside Total	2004	5.2%	15.9%	19.0%	45.3%	2.3%	0.4%	7.5%	3.7%	0.4%	0.2%
	2008	3.1%	13.8%	19.6%	44.9%	3.4%	0.5%	8.9%	5.1%	0.5%	0.2%
	2013	1.6%	8.9%	21.5%	44.2%	4.3%	0.5%	10.7%	7.5%	0.6%	0.2%
	2031	1.8%	1.1%	10.9%	45.6%	5.7%	0.8%	19.1%	13.1%	1.6%	0.3%
	2048	2.7%	1.4%	4.3%	38.4%	6.9%	0.9%	26.8%	14.5%	3.8%	0.3%
	2067	2.3%	1.4%	4.4%	27.0%	7.7%	1.0%	31.5%	15.4%	8.8%	0.4%

Table D-5b. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 2, by Planning Unit and Year

		Percent of Riparian Areas - Alternative 2									
HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	6.2%	12.0%	17.2%	52.0%	1.5%	0.8%	6.4%	3.4%	0.3%	0.3%
	2008	4.6%	10.9%	15.3%	52.5%	2.3%	0.9%	7.6%	5.3%	0.3%	0.3%
	2013	2.9%	8.6%	15.3%	50.6%	3.7%	1.0%	9.5%	7.8%	0.4%	0.3%
	2031	3.5%	1.7%	11.6%	39.9%	6.2%	1.2%	19.8%	13.9%	1.8%	0.4%
	2048	5.7%	2.6%	6.5%	29.9%	6.8%	1.2%	27.7%	15.2%	4.2%	0.3%
	2067	4.4%	3.2%	7.3%	22.2%	8.9%	1.3%	29.9%	13.7%	8.9%	0.3%
N. Puget	2004	5.9%	13.4%	14.2%	50.9%	5.3%	0.9%	5.4%	3.4%	0.2%	0.3%
	2008	4.6%	12.3%	14.8%	47.9%	7.0%	0.9%	7.4%	4.5%	0.4%	0.3%
	2013	3.1%	8.5%	17.1%	44.0%	8.0%	1.0%	9.2%	8.4%	0.4%	0.3%
	2031	2.9%	2.3%	11.1%	39.5%	9.1%	1.4%	15.8%	16.4%	1.0%	0.5%
	2048	4.1%	2.6%	6.4%	32.9%	11.1%	1.6%	22.6%	15.7%	2.5%	0.5%
	2067	4.0%	3.0%	6.3%	25.5%	12.8%	1.8%	26.7%	13.2%	6.4%	0.5%
OESF	2004	4.8%	25.0%	28.8%	20.3%	2.3%	0.3%	12.8%	4.3%	1.1%	0.3%
	2008	3.2%	20.7%	30.1%	23.0%	2.5%	0.3%	13.3%	5.4%	1.2%	0.3%
	2013	2.0%	11.8%	33.4%	27.9%	2.8%	0.4%	12.4%	7.8%	1.2%	0.3%
	2031	4.1%	2.6%	14.9%	46.2%	4.2%	0.8%	14.3%	10.8%	2.0%	0.3%
	2048	6.2%	5.1%	6.1%	41.6%	6.6%	1.0%	17.8%	12.9%	2.4%	0.4%
	2067	6.7%	5.9%	8.8%	25.9%	7.2%	1.0%	20.2%	18.8%	4.9%	0.7%
S. Coast	2004	5.5%	11.3%	15.3%	55.0%	1.3%	0.7%	6.8%	4.1%	0.1%	0.0%
	2008	4.1%	8.9%	17.7%	51.1%	2.4%	0.7%	7.8%	7.1%	0.2%	0.0%
	2013	3.3%	5.5%	18.9%	47.2%	3.7%	0.8%	10.3%	9.8%	0.5%	0.0%
	2031	3.0%	1.8%	7.1%	40.8%	5.7%	1.2%	19.8%	17.9%	2.6%	0.0%
	2048	5.8%	2.7%	5.6%	25.9%	7.9%	1.2%	26.6%	16.9%	7.4%	0.0%
	2067	5.4%	3.0%	7.7%	18.4%	9.5%	1.3%	26.8%	14.4%	13.5%	0.0%
S. Puget	2004	5.7%	12.8%	16.6%	55.0%	1.3%	1.2%	3.8%	3.5%	0.1%	0.0%
	2008	2.8%	13.8%	15.4%	55.3%	2.0%	1.3%	4.8%	4.3%	0.3%	0.0%
	2013	2.3%	8.6%	18.0%	53.2%	3.0%	1.4%	6.6%	6.4%	0.6%	0.0%
	2031	2.6%	1.8%	10.3%	50.4%	4.7%	1.8%	17.0%	10.4%	1.0%	0.0%
	2048	4.2%	2.2%	4.5%	42.7%	5.2%	2.1%	23.9%	13.3%	1.8%	0.0%
	2067	3.1%	2.8%	5.5%	32.1%	7.1%	2.2%	32.2%	9.9%	5.0%	0.0%
Straits	2004	5.9%	12.5%	9.7%	65.5%	1.3%	1.4%	2.2%	1.5%	0.0%	0.0%
	2008	4.7%	10.7%	11.8%	63.8%	2.7%	1.5%	2.5%	2.3%	0.0%	0.0%
	2013	3.5%	8.7%	13.6%	61.0%	4.2%	1.6%	3.3%	4.0%	0.2%	0.0%
	2031	3.7%	2.2%	11.8%	49.3%	8.8%	2.2%	11.9%	9.7%	0.3%	0.0%
	2048	4.2%	3.0%	5.1%	42.8%	10.5%	2.8%	20.6%	9.8%	1.1%	0.0%
	2067	5.1%	2.9%	5.9%	31.0%	12.5%	2.9%	26.0%	9.9%	3.8%	0.0%
Westside Total	2004	5.6%	15.7%	18.8%	45.0%	2.5%	0.7%	7.5%	3.7%	0.4%	0.2%
	2008	4.0%	13.6%	19.3%	44.3%	3.4%	0.8%	8.6%	5.3%	0.5%	0.2%
	2013	2.8%	8.8%	21.2%	43.3%	4.4%	0.8%	9.8%	8.0%	0.6%	0.2%
	2031	3.4%	2.1%	11.4%	42.9%	6.2%	1.2%	16.9%	13.9%	1.7%	0.3%
	2048	5.3%	3.3%	6.0%	34.5%	7.9%	1.4%	23.2%	14.6%	3.6%	0.3%
	2067	5.0%	3.8%	7.4%	24.4%	9.4%	1.5%	26.1%	14.5%	7.6%	0.4%

Table D-5c. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 3, by Planning Unit and Year

Percent of Riparian Areas - Alternative 3

HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	6.0%	12.2%	17.4%	51.8%	1.6%	0.5%	6.1%	3.7%	0.3%	0.3%
	2008	4.9%	11.1%	15.4%	51.6%	3.1%	0.6%	7.0%	5.8%	0.3%	0.3%
	2013	3.7%	8.7%	15.4%	49.2%	4.6%	0.6%	8.8%	8.2%	0.4%	0.3%
	2031	3.7%	2.5%	11.8%	38.8%	7.1%	0.9%	18.7%	14.4%	1.8%	0.3%
	2048	6.3%	3.0%	7.0%	29.1%	8.0%	0.9%	25.1%	16.2%	4.1%	0.3%
	2067	5.2%	3.8%	7.9%	22.0%	10.2%	1.1%	25.4%	15.7%	8.4%	0.3%
N. Puget	2004	5.8%	13.6%	14.3%	51.4%	5.0%	0.6%	5.6%	3.2%	0.2%	0.3%
	2008	3.7%	12.5%	15.0%	50.1%	5.5%	0.7%	7.5%	4.4%	0.3%	0.3%
	2013	2.2%	8.7%	17.4%	45.3%	7.3%	0.7%	9.3%	8.4%	0.4%	0.3%
	2031	3.9%	2.3%	10.9%	38.4%	10.1%	1.1%	15.2%	16.7%	0.9%	0.5%
	2048	5.0%	2.8%	6.8%	31.7%	11.9%	1.2%	20.7%	16.9%	2.4%	0.5%
	2067	3.8%	4.2%	6.8%	24.5%	13.9%	1.5%	23.7%	14.9%	6.3%	0.5%
OESF	2004	4.6%	25.1%	29.1%	21.0%	1.5%	0.1%	12.8%	4.3%	1.1%	0.3%
	2008	2.9%	20.8%	30.3%	23.8%	2.0%	0.2%	12.5%	5.9%	1.2%	0.3%
	2013	1.6%	11.8%	33.8%	28.5%	2.4%	0.2%	12.7%	7.4%	1.1%	0.3%
	2031	3.3%	1.4%	15.1%	47.7%	4.6%	0.4%	14.0%	11.3%	1.9%	0.3%
	2048	6.4%	4.9%	4.7%	37.4%	11.6%	0.5%	16.0%	15.5%	2.5%	0.4%
	2067	9.7%	8.0%	8.6%	18.9%	12.4%	0.6%	12.7%	23.9%	4.5%	0.6%
S. Coast	2004	5.3%	11.6%	15.5%	54.8%	1.6%	0.3%	6.5%	4.3%	0.1%	0.0%
	2008	4.2%	9.2%	17.9%	50.6%	3.0%	0.4%	7.2%	7.5%	0.1%	0.0%
	2013	3.4%	5.6%	19.2%	47.3%	4.0%	0.4%	9.5%	10.3%	0.3%	0.0%
	2031	3.8%	2.4%	7.1%	39.6%	6.2%	0.8%	17.7%	19.8%	2.7%	0.0%
	2048	7.9%	2.6%	6.4%	24.5%	9.7%	0.8%	22.0%	19.4%	6.6%	0.0%
	2067	4.3%	4.0%	9.5%	17.6%	11.6%	1.1%	22.7%	17.0%	12.1%	0.0%
S. Puget	2004	5.7%	12.9%	16.6%	55.1%	1.4%	1.0%	3.8%	3.5%	0.1%	0.0%
	2008	2.9%	13.9%	15.5%	54.9%	2.4%	1.0%	4.8%	4.3%	0.3%	0.0%
	2013	2.6%	8.7%	18.2%	52.3%	3.7%	1.0%	6.5%	6.3%	0.5%	0.0%
	2031	2.0%	2.2%	10.6%	50.6%	5.0%	1.4%	16.9%	10.2%	1.0%	0.0%
	2048	4.8%	2.0%	4.7%	41.3%	6.7%	1.8%	22.9%	14.1%	1.7%	0.0%
	2067	4.6%	3.0%	5.6%	30.4%	8.7%	2.0%	30.8%	10.6%	4.4%	0.0%
Straits	2004	5.6%	12.9%	9.9%	66.0%	1.2%	0.9%	2.0%	1.6%	0.0%	0.0%
	2008	4.9%	11.0%	12.0%	62.3%	4.2%	1.1%	2.1%	2.5%	0.0%	0.0%
	2013	5.0%	9.3%	13.7%	54.4%	9.3%	1.2%	3.0%	4.2%	0.1%	0.0%
	2031	3.9%	3.8%	11.9%	44.8%	12.9%	1.5%	9.7%	11.3%	0.2%	0.0%
	2048	6.1%	2.9%	6.9%	39.9%	13.5%	1.9%	14.8%	13.5%	0.6%	0.0%
	2067	5.7%	5.8%	6.6%	28.6%	16.4%	2.4%	20.2%	13.2%	1.1%	0.0%
Westside Total	2004	5.4%	15.9%	19.0%	45.2%	2.3%	0.5%	7.4%	3.7%	0.4%	0.2%
	2008	3.8%	13.8%	19.5%	44.6%	3.3%	0.5%	8.2%	5.5%	0.5%	0.2%
	2013	2.7%	8.9%	21.5%	43.1%	4.7%	0.6%	9.6%	8.1%	0.6%	0.2%
	2031	3.5%	2.2%	11.5%	42.4%	7.1%	0.9%	16.0%	14.6%	1.7%	0.3%
	2048	6.2%	3.3%	6.1%	32.5%	10.3%	1.0%	20.5%	16.5%	3.4%	0.3%
	2067	5.9%	5.0%	7.9%	21.9%	12.0%	1.2%	21.4%	17.4%	7.0%	0.3%

Table D-5d. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 4, by Planning Unit and Year

Percent of Riparian Areas - Alternative 4

HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	5.8%	12.2%	17.5%	51.9%	1.5%	0.5%	6.2%	3.7%	0.3%	0.4%
	2008	4.0%	11.1%	15.4%	52.3%	2.5%	0.6%	7.7%	5.7%	0.4%	0.4%
	2013	2.0%	8.7%	15.3%	51.0%	3.2%	0.7%	10.0%	8.1%	0.7%	0.4%
	2031	2.6%	1.0%	11.1%	43.3%	4.1%	0.9%	21.7%	12.5%	2.5%	0.4%
	2048	4.3%	1.8%	5.1%	32.6%	4.8%	0.8%	32.5%	11.0%	6.6%	0.4%
	2067	6.5%	3.4%	5.5%	24.7%	5.7%	0.9%	35.8%	5.7%	11.3%	0.4%
N. Puget	2004	5.5%	13.6%	14.4%	50.6%	5.8%	0.7%	5.6%	3.3%	0.3%	0.3%
	2008	3.6%	12.5%	15.0%	47.6%	7.6%	0.8%	7.6%	4.6%	0.4%	0.3%
	2013	2.0%	8.6%	17.3%	43.5%	8.6%	0.9%	9.4%	8.9%	0.6%	0.3%
	2031	2.1%	1.9%	10.5%	40.3%	8.9%	1.1%	17.1%	16.4%	1.2%	0.5%
	2048	5.0%	1.9%	5.5%	34.5%	9.7%	1.2%	23.5%	14.3%	3.9%	0.5%
	2067	5.4%	3.5%	6.3%	26.3%	10.3%	1.4%	28.1%	9.4%	8.8%	0.5%
OESF	2004	4.6%	25.1%	29.0%	21.1%	1.6%	0.1%	12.8%	4.3%	1.1%	0.3%
	2008	2.6%	20.8%	30.3%	23.9%	2.0%	0.2%	13.5%	5.3%	1.2%	0.3%
	2013	0.9%	11.8%	33.8%	28.5%	2.5%	0.2%	14.3%	6.5%	1.2%	0.3%
	2031	1.0%	0.8%	14.8%	50.8%	2.8%	0.4%	18.3%	8.9%	1.9%	0.3%
	2048	1.5%	0.7%	3.5%	50.6%	3.8%	0.4%	23.6%	12.8%	2.7%	0.4%
	2067	1.4%	1.1%	2.5%	31.6%	4.2%	0.4%	28.9%	23.5%	5.6%	0.8%
S. Coast	2004	5.0%	11.6%	15.5%	54.4%	2.0%	0.4%	6.7%	4.3%	0.1%	0.0%
	2008	3.0%	9.2%	17.8%	49.8%	3.4%	0.4%	7.9%	7.8%	0.6%	0.0%
	2013	2.0%	5.6%	19.0%	46.5%	3.9%	0.5%	10.4%	11.0%	1.0%	0.0%
	2031	3.9%	1.1%	5.9%	42.2%	5.1%	0.7%	20.7%	16.8%	3.6%	0.0%
	2048	5.0%	2.5%	5.1%	27.9%	6.3%	0.8%	28.4%	14.3%	9.8%	0.0%
	2067	8.7%	3.6%	6.6%	20.3%	6.9%	1.0%	30.0%	7.1%	15.8%	0.1%
S. Puget	2004	5.5%	12.9%	16.7%	55.2%	1.3%	1.0%	3.8%	3.6%	0.1%	0.0%
	2008	2.2%	13.9%	15.5%	55.6%	1.7%	1.1%	5.0%	4.7%	0.3%	0.0%
	2013	1.5%	8.6%	18.2%	53.3%	2.9%	1.2%	7.0%	6.9%	0.6%	0.0%
	2031	1.7%	1.4%	10.2%	51.9%	3.7%	1.5%	18.0%	10.3%	1.3%	0.0%
	2048	3.2%	1.4%	4.1%	44.6%	4.0%	1.6%	25.8%	12.6%	2.6%	0.0%
	2067	3.5%	2.0%	4.5%	34.1%	4.9%	1.7%	35.3%	8.4%	5.6%	0.0%
Straits	2004	5.3%	12.9%	9.9%	64.5%	2.7%	1.0%	2.2%	1.5%	0.0%	0.0%
	2008	3.9%	11.0%	12.0%	62.2%	4.6%	1.1%	2.5%	2.6%	0.1%	0.0%
	2013	2.6%	9.0%	13.9%	58.3%	6.6%	1.2%	3.4%	4.9%	0.2%	0.0%
	2031	3.3%	1.8%	11.5%	49.8%	8.9%	1.5%	11.8%	10.5%	0.9%	0.0%
	2048	6.0%	2.9%	4.5%	43.7%	9.9%	1.7%	19.4%	10.0%	2.0%	0.0%
	2067	5.7%	3.9%	7.2%	31.6%	10.1%	1.8%	25.4%	9.6%	4.7%	0.0%
Westside Total	2004	5.2%	15.9%	19.0%	44.9%	2.6%	0.5%	7.5%	3.8%	0.4%	0.2%
	2008	3.2%	13.8%	19.5%	44.1%	3.7%	0.6%	8.7%	5.5%	0.6%	0.2%
	2013	1.7%	8.9%	21.4%	43.2%	4.4%	0.6%	10.5%	8.2%	0.8%	0.2%
	2031	2.3%	1.2%	10.9%	45.4%	5.2%	0.8%	18.8%	12.9%	2.1%	0.3%
	2048	3.8%	1.7%	4.6%	38.3%	6.1%	0.9%	26.3%	12.9%	5.1%	0.3%
	2067	5.1%	2.8%	5.1%	27.1%	6.7%	1.0%	30.7%	11.8%	9.3%	0.4%

Table D-5e. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 5, by Planning Unit and Year

Percent of Riparian Areas - Alternative 5

HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	7.8%	13.4%	22.9%	48.8%	3.5%	0.5%	2.2%	0.5%	0.3%	0.1%
	2008	6.4%	12.3%	19.9%	51.7%	5.3%	0.7%	2.3%	0.9%	0.4%	0.1%
	2013	5.3%	9.5%	18.1%	52.6%	7.7%	0.9%	3.1%	2.2%	0.6%	0.1%
	2031	6.9%	2.6%	13.2%	45.8%	10.5%	1.1%	9.9%	9.0%	0.9%	0.1%
	2048	8.4%	4.7%	9.1%	29.6%	9.7%	1.1%	20.4%	14.3%	2.8%	0.1%
	2067	7.4%	3.8%	9.5%	21.3%	10.6%	1.1%	21.1%	16.4%	8.7%	0.1%
N. Puget	2004	8.0%	15.3%	15.8%	50.2%	5.9%	0.6%	2.7%	0.9%	0.3%	0.3%
	2008	6.3%	14.1%	15.7%	50.7%	7.4%	0.8%	3.2%	1.2%	0.3%	0.3%
	2013	4.7%	10.5%	17.0%	50.4%	9.7%	1.0%	4.2%	1.8%	0.4%	0.3%
	2031	5.6%	2.7%	12.4%	41.3%	12.1%	1.3%	10.8%	12.7%	0.6%	0.5%
	2048	7.4%	4.0%	7.6%	27.8%	12.3%	1.3%	20.1%	16.8%	2.4%	0.2%
	2067	6.2%	4.4%	8.0%	19.6%	13.3%	1.4%	23.3%	16.3%	7.4%	0.2%
OESF	2004	6.7%	27.6%	28.2%	20.9%	2.7%	0.2%	8.1%	1.1%	4.3%	0.3%
	2008	5.3%	24.0%	28.5%	23.8%	3.8%	0.3%	8.0%	1.8%	4.4%	0.3%
	2013	5.3%	14.9%	29.1%	28.8%	5.6%	0.4%	8.0%	3.5%	4.0%	0.4%
	2031	12.2%	6.5%	12.9%	33.4%	10.5%	0.9%	6.5%	11.1%	5.7%	0.3%
	2048	12.0%	13.5%	10.7%	19.2%	9.3%	0.7%	5.0%	17.1%	12.2%	0.2%
	2067	12.2%	13.4%	14.1%	16.8%	7.0%	0.9%	5.7%	16.5%	12.6%	0.7%
S. Coast	2004	8.8%	14.4%	14.6%	55.3%	2.4%	0.4%	2.2%	1.7%	0.1%	0.0%
	2008	7.9%	10.9%	17.3%	52.8%	4.6%	0.5%	2.9%	3.0%	0.2%	0.0%
	2013	6.9%	6.3%	19.2%	51.3%	6.5%	0.5%	4.3%	4.6%	0.3%	0.1%
	2031	7.1%	1.9%	9.1%	42.9%	7.8%	0.9%	13.2%	15.7%	1.3%	0.1%
	2048	8.8%	4.5%	7.2%	20.3%	7.7%	0.8%	25.3%	21.5%	4.0%	0.1%
	2067	7.2%	3.9%	9.8%	11.0%	8.1%	0.9%	25.5%	20.1%	13.5%	0.1%
S. Puget	2004	7.3%	15.6%	22.4%	49.1%	2.3%	1.0%	1.7%	0.6%	0.1%	0.0%
	2008	4.9%	15.0%	20.6%	51.8%	3.7%	1.2%	2.0%	0.7%	0.1%	0.0%
	2013	4.4%	10.7%	20.2%	52.6%	6.3%	1.5%	2.6%	1.5%	0.2%	0.0%
	2031	5.4%	2.6%	12.6%	54.5%	8.9%	2.0%	6.7%	6.8%	0.5%	0.0%
	2048	7.6%	4.3%	6.3%	44.4%	7.6%	2.2%	15.6%	10.6%	1.4%	0.0%
	2067	6.4%	4.9%	7.8%	29.8%	8.2%	2.0%	25.3%	11.8%	3.8%	0.0%
Straits	2004	8.4%	13.2%	15.2%	57.7%	3.2%	0.9%	0.5%	0.9%	0.0%	0.0%
	2008	7.8%	13.1%	14.2%	55.3%	6.4%	1.1%	0.8%	1.1%	0.1%	0.0%
	2013	6.3%	10.3%	15.0%	53.8%	9.8%	1.4%	0.9%	2.3%	0.1%	0.0%
	2031	6.8%	2.9%	11.4%	51.8%	13.7%	1.9%	2.9%	8.0%	0.6%	0.0%
	2048	8.2%	5.4%	6.0%	43.0%	13.9%	2.3%	7.8%	11.7%	1.8%	0.0%
	2067	8.5%	5.3%	8.2%	30.6%	15.4%	2.3%	13.6%	10.7%	5.4%	0.0%
Westside Tota	2004	7.7%	17.9%	20.8%	43.5%	3.5%	0.5%	3.7%	1.0%	1.3%	0.2%
	2008	6.3%	15.7%	20.5%	44.6%	5.2%	0.6%	4.0%	1.6%	1.3%	0.2%
	2013	5.5%	10.6%	21.0%	45.7%	7.4%	0.8%	4.7%	2.9%	1.3%	0.2%
	2031	7.9%	3.5%	12.0%	42.0%	10.4%	1.2%	9.3%	11.4%	2.1%	0.2%
	2048	9.1%	6.8%	8.5%	26.6%	9.8%	1.1%	16.2%	16.5%	5.2%	0.1%
	2067	8.3%	6.6%	10.2%	19.0%	9.8%	1.2%	18.4%	16.4%	9.8%	0.3%

Table D-5f. Percentage Distribution of Stand Development Stages in Riparian Areas Under Alternative 6, by Planning Unit and Year

		Percent of Riparian Areas - Alternative 6									
HCP Unit	Year	Ecosystem Initiation	Sapling Exclusion	Pole Exclusion	Large Tree Exclusion	Understory Reinitiation	Developed Understory	Botanically Diverse	Niche Diversification	Fully Functional	Old Growth - Natural
Columbia	2004	13.4%	12.4%	19.6%	37.3%	4.0%	0.5%	7.5%	3.4%	1.8%	0.1%
	2008	14.2%	11.7%	16.4%	37.7%	4.8%	0.6%	7.9%	4.2%	2.4%	0.1%
	2013	12.0%	11.2%	14.4%	39.0%	5.4%	0.6%	9.0%	5.1%	3.2%	0.1%
	2031	13.9%	4.0%	17.9%	27.4%	7.4%	0.7%	12.6%	9.4%	6.4%	0.1%
	2048	13.2%	7.2%	12.6%	20.6%	10.9%	1.1%	11.9%	13.2%	9.1%	0.1%
	2067	13.9%	8.7%	12.6%	15.9%	14.8%	1.4%	7.7%	11.4%	13.6%	0.1%
N. Puget	2004	12.3%	13.2%	17.1%	38.0%	7.5%	0.6%	6.1%	4.4%	0.8%	0.1%
	2008	15.1%	12.2%	16.3%	33.5%	9.0%	0.7%	6.2%	5.9%	0.9%	0.0%
	2013	12.7%	9.6%	17.0%	34.9%	9.9%	0.8%	7.5%	6.3%	1.3%	0.0%
	2031	11.7%	3.8%	17.1%	31.2%	11.2%	1.1%	9.5%	11.3%	3.1%	0.1%
	2048	11.7%	6.2%	9.3%	26.1%	13.8%	1.6%	14.2%	12.4%	4.6%	0.1%
	2067	10.5%	8.2%	9.6%	19.6%	15.3%	1.7%	14.3%	12.6%	8.2%	0.1%
OESF	2004	6.2%	29.9%	26.5%	19.0%	1.9%	0.1%	8.2%	2.7%	5.1%	0.4%
	2008	3.4%	25.3%	29.3%	20.5%	3.0%	0.2%	5.2%	7.5%	5.5%	0.2%
	2013	1.1%	15.8%	33.5%	26.2%	3.6%	0.2%	5.6%	8.1%	5.6%	0.3%
	2031	0.7%	0.2%	20.3%	44.5%	6.0%	0.5%	7.5%	13.6%	6.5%	0.3%
	2048	0.7%	0.0%	1.7%	38.3%	15.0%	0.6%	7.6%	26.1%	9.9%	0.1%
	2067	0.7%	0.0%	0.3%	21.4%	9.7%	0.6%	8.2%	44.9%	13.6%	0.7%
S. Coast	2004	14.1%	12.8%	13.2%	41.3%	4.5%	0.4%	8.5%	3.8%	1.4%	0.0%
	2008	20.7%	10.2%	14.1%	32.1%	9.3%	0.4%	5.2%	6.0%	2.0%	0.0%
	2013	21.3%	7.0%	14.9%	30.1%	10.1%	0.4%	5.6%	6.9%	3.5%	0.1%
	2031	22.2%	5.6%	16.9%	25.0%	8.1%	0.5%	5.8%	10.1%	5.8%	0.1%
	2048	17.9%	12.4%	14.7%	16.4%	11.0%	0.8%	8.5%	11.6%	6.7%	0.1%
	2067	17.2%	16.1%	15.0%	14.7%	14.4%	1.0%	5.1%	10.1%	6.3%	0.1%
S. Puget	2004	8.2%	13.2%	20.7%	44.4%	2.2%	1.0%	7.4%	2.3%	0.5%	0.0%
	2008	7.1%	12.6%	19.7%	44.5%	3.6%	1.1%	7.8%	2.8%	0.7%	0.0%
	2013	6.7%	9.1%	19.8%	43.1%	4.5%	1.3%	9.1%	4.3%	2.1%	0.0%
	2031	4.3%	1.5%	13.5%	41.7%	6.8%	1.8%	14.7%	10.1%	5.5%	0.0%
	2048	4.6%	1.5%	3.7%	36.1%	9.6%	2.8%	19.9%	14.2%	7.7%	0.0%
	2067	5.2%	2.0%	3.0%	21.7%	13.3%	2.9%	25.9%	14.8%	11.2%	0.0%
Straits	2004	15.0%	11.6%	10.1%	49.7%	4.2%	1.0%	5.0%	2.6%	0.9%	0.0%
	2008	18.2%	11.2%	10.5%	38.3%	10.0%	1.1%	5.6%	4.2%	0.9%	0.0%
	2013	21.4%	10.4%	11.4%	31.5%	9.9%	1.0%	8.3%	4.9%	1.1%	0.0%
	2031	16.4%	9.0%	17.4%	27.4%	8.7%	1.1%	9.0%	8.6%	2.4%	0.0%
	2048	16.3%	8.9%	13.8%	24.2%	12.0%	2.0%	11.2%	9.5%	2.3%	0.0%
	2067	17.3%	10.4%	14.1%	20.1%	14.3%	2.3%	10.2%	7.0%	4.2%	0.0%
Westside Total	2004	11.1%	17.2%	19.3%	34.6%	4.2%	0.5%	7.5%	3.4%	2.2%	0.1%
	2008	12.4%	15.1%	19.3%	31.8%	6.2%	0.6%	6.2%	5.6%	2.6%	0.1%
	2013	11.1%	11.0%	20.3%	33.1%	7.0%	0.6%	7.1%	6.4%	3.3%	0.1%
	2031	10.9%	3.3%	17.8%	33.4%	8.0%	0.8%	9.3%	11.1%	5.3%	0.1%
	2048	9.9%	5.7%	8.8%	27.0%	12.6%	1.2%	11.3%	16.0%	7.4%	0.1%
	2067	9.8%	7.3%	8.5%	18.6%	13.3%	1.3%	10.4%	20.2%	10.4%	0.2%

Table D-6a. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade under Alternative 1, by Planning Unit

Percent of Riparian Area Harvested - Alt 1						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013			2.9%	2.9%	86,443
	2014-2023			3.2%	3.2%	
	2024-2033			4.0%	4.0%	
	2034-2043			3.6%	3.6%	
	2044-2053			3.1%	3.1%	
	2054-2063			4.6%	4.6%	
	2064-2067			1.8%	1.8%	
	Mean 2004-2063			3.6%	3.6%	
N. Puget	2004-2013			2.4%	2.4%	92,724
	2014-2023			2.7%	2.7%	
	2024-2033			3.2%	3.2%	
	2034-2043			3.2%	3.2%	
	2044-2053			3.1%	3.1%	
	2054-2063			3.2%	3.2%	
	2064-2067			0.8%	0.8%	
	Mean 2004-2063			2.9%	2.9%	
OESF	2004-2013			1.5%	1.5%	111,308
	2014-2023			1.6%	1.6%	
	2024-2033			2.7%	2.7%	
	2034-2043			2.5%	2.5%	
	2044-2053			2.2%	2.2%	
	2054-2063			2.8%	2.8%	
	2064-2067			1.2%	1.2%	
	Mean 2004-2063			2.3%	2.3%	
S. Coast	2004-2013			2.3%	2.3%	80,966
	2014-2023			3.4%	3.4%	
	2024-2033			4.7%	4.7%	
	2034-2043			3.5%	3.5%	
	2044-2053			4.2%	4.2%	
	2054-2063			3.5%	3.5%	
	2064-2067			1.0%	1.0%	
	Mean 2004-2063			3.5%	3.5%	
S. Puget	2004-2013			1.6%	1.6%	34,606
	2014-2023			2.9%	2.9%	
	2024-2033			3.6%	3.6%	
	2034-2043			3.8%	3.8%	
	2044-2053			3.5%	3.5%	
	2054-2063			3.3%	3.3%	
	2064-2067			1.6%	1.6%	
	Mean 2004-2063			3.2%	3.2%	
Straits	2004-2013			1.5%	1.5%	20,684
	2014-2023			0.9%	0.9%	
	2024-2033			2.5%	2.5%	
	2034-2043			2.4%	2.4%	
	2044-2053			1.3%	1.3%	
	2054-2063			2.5%	2.5%	
	2064-2067			0.8%	0.8%	
	Mean 2004-2063			1.9%	1.9%	
Total	2004-2013			2.1%	2.1%	426,731
	2014-2023			2.6%	2.6%	
	2024-2033			3.5%	3.5%	
	2034-2043			3.2%	3.2%	
	2044-2053			3.0%	3.0%	
	2054-2063			3.4%	3.4%	
	2064-2067			1.2%	1.2%	
	Mean 2004-2063			3.0%	3.0%	

Table D-6b. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade under Alternative 2, by Planning Unit

Percent of Riparian Area Harvested - Alt 2						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013	2.0%	1.2%	1.3%	4.5%	86,443
	2014-2023	2.6%	0.9%	1.4%	4.9%	
	2024-2033	2.3%	1.6%	2.5%	6.4%	
	2034-2043	1.0%	2.8%	3.4%	7.2%	
	2044-2053	0.8%	3.0%	3.7%	7.5%	
	2054-2063	1.3%	3.7%	2.7%	7.7%	
	2064-2067	0.3%	1.5%	0.7%	2.5%	
	Mean 2004-2063	1.6%	2.3%	2.4%	6.4%	
N. Puget	2004-2013	1.3%	1.3%	1.3%	3.9%	92,724
	2014-2023	1.8%	1.4%	1.7%	4.9%	
	2024-2033	2.3%	1.7%	1.8%	5.8%	
	2034-2043	0.8%	1.9%	2.4%	5.2%	
	2044-2053	1.4%	1.9%	3.2%	6.6%	
	2054-2063	0.9%	3.3%	3.3%	7.5%	
	2064-2067	0.4%	1.0%	0.7%	2.1%	
	Mean 2004-2063	1.4%	2.0%	2.3%	5.6%	
OESF	2004-2013	1.5%	0.6%	2.0%	4.1%	111,308
	2014-2023	1.8%	1.3%	1.9%	5.0%	
	2024-2033	1.1%	1.5%	5.0%	7.6%	
	2034-2043	1.0%	2.5%	6.0%	9.4%	
	2044-2053	0.7%	2.5%	5.2%	8.4%	
	2054-2063	1.0%	2.8%	7.4%	11.2%	
	2064-2067	0.4%	0.7%	2.5%	3.7%	
	Mean 2004-2063	1.2%	1.9%	4.7%	7.7%	
S. Coast	2004-2013	2.0%	1.7%	1.6%	5.3%	80,966
	2014-2023	2.6%	1.1%	1.6%	5.4%	
	2024-2033	3.0%	2.4%	2.9%	8.3%	
	2034-2043	1.7%	3.0%	3.7%	8.5%	
	2044-2053	1.2%	3.2%	3.7%	8.1%	
	2054-2063	1.4%	4.8%	4.5%	10.7%	
	2064-2067	0.4%	1.5%	1.1%	3.0%	
	Mean 2004-2063	1.9%	2.8%	3.0%	7.7%	
S. Puget	2004-2013	0.6%	0.9%	0.9%	2.4%	34,606
	2014-2023	1.7%	0.6%	0.8%	3.1%	
	2024-2033	1.8%	1.1%	1.3%	4.3%	
	2034-2043	1.0%	1.7%	2.6%	5.3%	
	2044-2053	0.9%	1.6%	2.5%	5.0%	
	2054-2063	1.5%	1.8%	1.5%	4.8%	
	2064-2067	0.3%	0.9%	0.6%	1.8%	
	Mean 2004-2063	1.2%	1.3%	1.6%	4.2%	
Straits	2004-2013	1.0%	1.2%	0.8%	3.0%	20,684
	2014-2023	1.2%	1.7%	1.5%	4.3%	
	2024-2033	2.1%	1.4%	1.4%	4.9%	
	2034-2043	2.0%	2.0%	1.6%	5.6%	
	2044-2053	1.9%	2.2%	1.9%	6.0%	
	2054-2063	3.0%	3.6%	2.4%	8.9%	
	2064-2067	1.2%	0.9%	0.8%	2.9%	
	Mean 2004-2063	1.9%	2.0%	1.6%	5.6%	
Total	2004-2013	1.5%	1.2%	1.5%	4.2%	426,731
	2014-2023	2.1%	1.2%	1.6%	4.8%	
	2024-2033	2.0%	1.7%	2.9%	6.7%	
	2034-2043	1.1%	2.5%	3.8%	7.4%	
	2044-2053	1.1%	2.5%	3.8%	7.4%	
	2054-2063	1.3%	3.4%	4.3%	8.9%	
	2064-2067	0.4%	1.1%	1.2%	2.8%	
	Mean 2004-2063	1.5%	2.1%	3.0%	6.6%	

Table D-6c. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade under Alternative 3, by Planning Unit

Percent of Riparian Area Harvested - Alt 3						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013	2.5%	1.8%	2.2%	6.5%	86,443
	2014-2023	3.2%	1.7%	1.9%	6.8%	
	2024-2033	3.0%	1.6%	2.4%	7.0%	
	2034-2043	1.3%	3.3%	4.2%	8.8%	
	2044-2053	0.9%	3.8%	4.8%	9.5%	
	2054-2063	1.4%	4.5%	3.3%	9.2%	
	2064-2067	0.5%	1.2%	1.0%	2.7%	
	Mean 2004-2063	2.0%	2.8%	3.1%	7.9%	
N. Puget	2004-2013	1.0%	1.1%	1.1%	3.1%	92,724
	2014-2023	2.3%	2.2%	2.3%	6.9%	
	2024-2033	3.0%	1.8%	1.7%	6.5%	
	2034-2043	1.4%	2.3%	2.9%	6.6%	
	2044-2053	1.1%	3.7%	5.2%	10.1%	
	2054-2063	1.1%	3.5%	2.3%	6.9%	
	2064-2067	0.4%	1.2%	0.7%	2.3%	
	Mean 2004-2063	1.6%	2.5%	2.5%	6.6%	
OESF	2004-2013	0.7%	1.0%	1.2%	2.9%	111,308
	2014-2023	1.0%	0.7%	0.8%	2.5%	
	2024-2033	1.4%	3.5%	3.7%	8.5%	
	2034-2043	1.2%	3.4%	5.0%	9.6%	
	2044-2053	1.3%	5.6%	10.9%	17.8%	
	2054-2063	0.9%	4.8%	9.0%	14.7%	
	2064-2067	0.5%	1.9%	6.3%	8.7%	
	Mean 2004-2063	1.1%	3.3%	5.8%	10.1%	
S. Coast	2004-2013	2.1%	2.0%	2.1%	6.2%	80,966
	2014-2023	4.4%	2.1%	2.6%	9.1%	
	2024-2033	4.1%	2.3%	2.5%	8.9%	
	2034-2043	1.5%	3.3%	4.9%	9.7%	
	2044-2053	1.0%	4.8%	6.3%	12.1%	
	2054-2063	1.0%	4.4%	2.6%	8.0%	
	2064-2067	0.5%	2.3%	0.7%	3.5%	
	Mean 2004-2063	2.3%	3.3%	3.4%	9.0%	
S. Puget	2004-2013	0.6%	1.0%	1.2%	2.8%	34,606
	2014-2023	1.4%	0.8%	0.9%	3.1%	
	2024-2033	1.9%	0.9%	1.2%	4.1%	
	2034-2043	1.3%	2.5%	2.5%	6.2%	
	2044-2053	0.8%	1.4%	2.7%	4.8%	
	2054-2063	0.9%	2.2%	2.3%	5.5%	
	2064-2067	0.5%	1.3%	1.3%	3.1%	
	Mean 2004-2063	1.2%	1.6%	1.9%	4.6%	
Straits	2004-2013	1.7%	3.1%	2.2%	7.0%	20,684
	2014-2023	2.7%	2.0%	1.5%	6.3%	
	2024-2033	3.5%	0.8%	0.8%	5.2%	
	2034-2043	1.9%	5.1%	2.8%	9.9%	
	2044-2053	1.6%	4.5%	4.4%	10.6%	
	2054-2063	1.1%	3.3%	2.4%	6.8%	
	2064-2067	0.4%	1.5%	0.7%	2.6%	
	Mean 2004-2063	2.0%	3.2%	2.3%	7.6%	
Total	2004-2013	1.4%	1.5%	1.6%	4.5%	426,731
	2014-2023	2.5%	1.6%	1.7%	5.8%	
	2024-2033	2.7%	2.2%	2.4%	7.3%	
	2034-2043	1.4%	3.1%	4.1%	8.5%	
	2044-2053	1.1%	4.3%	6.6%	11.9%	
	2054-2063	1.1%	4.1%	4.3%	9.5%	
	2064-2067	0.5%	1.6%	2.3%	4.4%	
	Mean 2004-2063	1.7%	2.9%	3.6%	8.1%	

Table D-6d. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade under Alternative 4, by Planning Unit

Percent of Riparian Area Harvested - Alt 4						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013			5.2%	5.2%	86,443
	2014-2023			4.6%	4.6%	
	2024-2033			5.7%	5.7%	
	2034-2043			5.9%	5.9%	
	2044-2053			6.3%	6.3%	
	2054-2063			7.7%	7.7%	
	2064-2067			2.9%	2.9%	
	Mean 2004-2063			6.0%	6.0%	
N. Puget	2004-2013			4.1%	4.1%	92,724
	2014-2023			3.3%	3.3%	
	2024-2033			4.4%	4.4%	
	2034-2043			5.7%	5.7%	
	2044-2053			6.4%	6.4%	
	2054-2063			7.1%	7.1%	
	2064-2067			2.5%	2.5%	
	Mean 2004-2063			5.2%	5.2%	
OESF	2004-2013			1.2%	1.2%	111,308
	2014-2023			1.1%	1.1%	
	2024-2033			1.5%	1.5%	
	2034-2043			1.5%	1.5%	
	2044-2053			1.5%	1.5%	
	2054-2063			1.5%	1.5%	
	2064-2067			0.7%	0.7%	
	Mean 2004-2063			1.4%	1.4%	
S. Coast	2004-2013			6.3%	6.3%	80,966
	2014-2023			6.3%	6.3%	
	2024-2033			6.7%	6.7%	
	2034-2043			7.1%	7.1%	
	2044-2053			7.8%	7.8%	
	2054-2063			10.5%	10.5%	
	2064-2067			4.0%	4.0%	
	Mean 2004-2063			7.6%	7.6%	
S. Puget	2004-2013			2.5%	2.5%	34,606
	2014-2023			2.8%	2.8%	
	2024-2033			3.2%	3.2%	
	2034-2043			3.6%	3.6%	
	2044-2053			3.6%	3.6%	
	2054-2063			3.7%	3.7%	
	2064-2067			1.9%	1.9%	
	Mean 2004-2063			3.3%	3.3%	
STRAITS	2004-2013			4.1%	4.1%	20,684
	2014-2023			3.7%	3.7%	
	2024-2033			6.1%	6.1%	
	2034-2043			7.3%	7.3%	
	2044-2053			7.5%	7.5%	
	2054-2063			7.3%	7.3%	
	2064-2067			3.3%	3.3%	
	Mean 2004-2063			6.2%	6.2%	
Total	2004-2013			3.8%	3.8%	426,731
	2014-2023			3.5%	3.5%	
	2024-2033			4.3%	4.3%	
	2034-2043			4.8%	4.8%	
	2044-2053			5.2%	5.2%	
	2054-2063			6.1%	6.1%	
	2064-2067			2.4%	2.4%	
	Mean 2004-2063			4.7%	4.7%	

Table D-6e. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade under Alternative 5, by Planning Unit

Percent of Riparian Area Harvested - Alt 5						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013	5.0%	2.2%	1.7%	8.9%	86,443
	2014-2023	4.1%	1.6%	3.1%	8.8%	
	2024-2033	4.0%	2.7%	3.9%	10.5%	
	2034-2043	1.3%	2.6%	4.8%	8.7%	
	2044-2053	1.1%	4.0%	5.3%	10.3%	
	2054-2063	2.0%	5.5%	3.1%	10.6%	
	2064-2067	0.7%	1.4%	1.1%	3.2%	
	Mean 2004-2063	2.8%	3.1%	3.6%	9.5%	
N. Puget	2004-2013	2.0%	1.6%	1.4%	5.0%	92,724
	2014-2023	3.5%	1.4%	2.1%	7.0%	
	2024-2033	3.4%	3.4%	3.0%	9.9%	
	2034-2043	1.6%	2.0%	4.0%	7.7%	
	2044-2053	1.6%	4.0%	4.8%	10.4%	
	2054-2063	2.2%	3.3%	2.8%	8.2%	
	2064-2067	0.8%	1.0%	1.2%	3.0%	
	Mean 2004-2063	2.4%	2.6%	3.0%	8.0%	
OESF	2004-2013	13.4%	3.2%	4.7%	21.3%	111,308
	2014-2023	15.4%	3.7%	7.0%	26.1%	
	2024-2033	18.1%	3.7%	11.1%	32.9%	
	2034-2043	10.9%	4.1%	11.4%	26.5%	
	2044-2053	5.3%	2.9%	13.9%	22.1%	
	2054-2063	9.0%	2.9%	9.3%	21.1%	
	2064-2067	4.0%	1.9%	2.9%	8.8%	
	Mean 2004-2063	11.9%	3.5%	9.4%	24.8%	
S. Coast	2004-2013	4.0%	1.9%	1.9%	7.8%	80,966
	2014-2023	4.8%	1.6%	2.7%	9.0%	
	2024-2033	4.3%	3.7%	4.3%	12.3%	
	2034-2043	1.7%	3.3%	5.2%	10.2%	
	2044-2053	1.4%	5.3%	5.8%	12.4%	
	2054-2063	2.5%	4.7%	3.3%	10.4%	
	2064-2067	0.7%	1.8%	1.0%	3.6%	
	Mean 2004-2063	3.0%	3.5%	3.8%	10.3%	
S. Puget	2004-2013	3.6%	1.6%	1.4%	6.5%	34,606
	2014-2023	3.9%	1.0%	2.2%	7.2%	
	2024-2033	3.1%	2.4%	3.4%	8.9%	
	2034-2043	1.9%	1.9%	3.7%	7.5%	
	2044-2053	1.7%	2.3%	4.0%	8.0%	
	2054-2063	2.4%	2.8%	3.2%	8.4%	
	2064-2067	1.3%	1.1%	1.1%	3.4%	
	Mean 2004-2063	2.8%	2.0%	3.0%	7.8%	
Straits	2004-2013	4.6%	2.3%	1.3%	8.2%	20,684
	2014-2023	5.0%	1.0%	1.4%	7.4%	
	2024-2033	5.3%	3.1%	2.7%	11.1%	
	2034-2043	2.3%	2.8%	4.0%	9.1%	
	2044-2053	4.5%	2.5%	3.2%	10.2%	
	2054-2063	4.5%	3.7%	3.4%	11.5%	
	2064-2067	1.0%	1.4%	1.3%	3.7%	
	Mean 2004-2063	4.3%	2.6%	2.7%	9.6%	
Total	2004-2013	6.2%	2.2%	2.4%	10.8%	426,731
	2014-2023	7.0%	2.0%	3.7%	12.8%	
	2024-2033	7.6%	3.3%	5.6%	16.4%	
	2034-2043	4.0%	3.0%	6.3%	13.3%	
	2044-2053	2.6%	3.7%	7.3%	13.6%	
	2054-2063	4.1%	3.9%	4.7%	12.7%	
	2064-2067	1.7%	1.5%	1.6%	4.7%	
	Mean 2004-2063	5.2%	3.1%	4.9%	13.2%	

Table D-6f. Percent of Riparian Area in which Timber Harvest Activities would Occur per Decade Under Alternative 1, by Planning Unit

Percent of Riparian Area Harvested - Alt 6						
		Harvest Type				
Planning Unit	Decade	A (Area_Net)	B (Area_Gross)	C (Area_Gross)	Grand Total	Total RMZ Acres
Columbia	2004-2013	9.7%	2.7%	5.0%	17.3%	86,443
	2014-2023	9.5%	3.4%	8.3%	21.2%	
	2024-2033	10.7%	6.6%	12.1%	29.5%	
	2034-2043	15.8%	5.4%	8.8%	30.0%	
	2044-2053	20.4%	8.6%	16.2%	45.3%	
	2054-2063	24.8%	5.9%	10.1%	40.8%	
	2064-2067	9.0%	4.6%	6.9%	20.4%	
	Mean 2004-2063	15.6%	5.8%	10.5%	32.0%	
N. Puget	2004-2013	11.0%	3.3%	6.0%	20.3%	92,724
	2014-2023	10.9%	1.8%	4.9%	17.7%	
	2024-2033	11.6%	5.1%	11.2%	27.8%	
	2034-2043	15.9%	3.7%	5.7%	25.3%	
	2044-2053	17.1%	6.2%	13.5%	36.8%	
	2054-2063	18.5%	3.8%	7.0%	29.2%	
	2064-2067	6.5%	3.5%	4.9%	14.9%	
	Mean 2004-2063	14.3%	4.3%	8.3%	26.9%	
OESF	2004-2013	39.6%	1.5%	0.3%	41.4%	111,308
	2014-2023	54.4%	1.6%	0.2%	56.2%	
	2024-2033	52.8%	2.7%	0.3%	55.8%	
	2034-2043	68.7%	2.9%	0.5%	72.1%	
	2044-2053	69.7%	2.9%	0.5%	73.1%	
	2054-2063	52.1%	2.2%	0.4%	54.7%	
	2064-2067	15.6%	0.7%	0.1%	16.4%	
	Mean 2004-2063	55.1%	2.3%	0.4%	57.8%	
S. Coast	2004-2013	7.6%	6.7%	12.1%	26.4%	80,966
	2014-2023	3.6%	3.4%	7.9%	15.0%	
	2024-2033	1.7%	11.9%	21.9%	35.4%	
	2034-2043	1.3%	4.6%	9.2%	15.0%	
	2044-2053	2.1%	7.9%	26.7%	36.7%	
	2054-2063	1.0%	4.0%	14.1%	19.0%	
	2064-2067	0.8%	4.4%	9.3%	14.4%	
	Mean 2004-2063	2.8%	6.7%	15.8%	25.3%	
S. Puget	2004-2013	11.5%	2.0%	2.9%	16.4%	34,606
	2014-2023	11.9%	1.3%	1.2%	14.5%	
	2024-2033	15.6%	4.1%	6.0%	25.7%	
	2034-2043	27.5%	3.7%	4.3%	35.5%	
	2044-2053	21.5%	6.3%	5.2%	33.0%	
	2054-2063	25.1%	7.1%	4.6%	36.8%	
	2064-2067	9.9%	2.3%	1.3%	13.6%	
	Mean 2004-2063	19.2%	4.2%	4.0%	27.4%	
Straits	2004-2013	5.6%	5.1%	13.0%	23.6%	20,684
	2014-2023	5.6%	2.5%	2.6%	10.7%	
	2024-2033	4.0%	6.1%	16.2%	26.3%	
	2034-2043	4.5%	5.7%	9.8%	20.0%	
	2044-2053	3.5%	8.0%	13.1%	24.6%	
	2054-2063	3.4%	5.1%	9.0%	17.5%	
	2064-2067	0.7%	2.4%	4.0%	7.1%	
	Mean 2004-2063	4.3%	5.4%	10.6%	20.3%	
Total	2004-2013	17.3%	3.3%	5.6%	26.2%	426,731
	2014-2023	20.4%	2.4%	4.5%	27.3%	
	2024-2033	20.2%	6.0%	10.4%	36.6%	
	2034-2043	27.3%	4.1%	5.7%	37.1%	
	2044-2053	28.3%	6.3%	12.5%	47.1%	
	2054-2063	25.0%	4.1%	7.2%	36.3%	
	2064-2067	8.3%	3.0%	4.5%	15.8%	
	Mean 2004-2063	23.0%	4.6%	7.9%	35.4%	

D.4 ADDITIONAL ANALYSES FOR THE WILDLIFE SECTION

Tables D-7 through D-11 support discussions of effects to wildlife species and habitats.

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Table D-7. Status, Habitat Associations, and Distribution of Threatened, Endangered, and Sensitive (TES) Wildlife Species that May Occur on DNR Westside Trust Lands

Species	Status[1/]	Habitat Association and Distribution [2/]
Mardon Skipper *Polites mardon*	SE FC	Open grasslands on glacial outwash prairies in the Puget lowlands; may occur in the South Puget and South Coast planning units.
Oregon Silverspot Butterfly *Speyeria zerene hippolyta*	SE FT	Coastal grasslands with *Viola adunca* on the Long Beach peninsula.
Larch Mountain Salamander *Plethodon larselli*	SS FCo	Talus with organic debris, structurally complex forest; may occur in the North Puget, South Puget, and Columbia planning units (Crisafulli 1999).
Oregon Spotted Frog *Rana pretiosa*	SE FC	Marshy ponds, streams, and lakes; three extant populations in the South Puget and Columbia planning units (McAllister and Leonard 1997).
Northwestern Pond Turtle *Clemmys marmorata*	SE FCo	Marshes, sloughs, ponds, and nearby uplands; may occur in North Puget, South Puget, Columbia, and South Coast planning units.
Common Loon *Gavia immer*	SS	Large wooded lakes with abundant fish; may occur in the North Puget, South Puget, South Coast, OESF, or Straits planning units.
Aleutian Canada Goose *Branta canadensis leucopareia*	ST	Migrant or winter resident in lakes, ponds, wetlands, grasslands, or agricultural fields in SW Washington or Puget lowlands.
Bald Eagle *Haliaeetus leucocephalus*	ST FT	Riparian and coastal areas, mature and old-growth forest within 1 mile of water; found in all planning units.
Peregrine Falcon *Falco peregrinus*	SS FCo	Cliffs provide breeding habitat; foraging habitat includes wetlands and open habitats; found in all planning units.
Sandhill Crane *Grus canadensis*	SE	Nests in extensive shallow marshes with dense emergent plant cover, forages in wet meadows and grasslands; may occur in the Columbia planning unit.
Marbled Murrelet *Brachyramphus marmoratus*	ST FT	Structurally complex and old-growth forests; found in all planning units, mostly within 40 miles of marine waters, maximum 52 miles inland.
Northern Spotted Owl *Strix occidentalis caurina*	SE FT	Structurally complex and old-growth forests; found in all planning units.
Western Gray Squirrel *Sciurus griseus*	ST FCo	Closed-canopy white-oak/Douglas-fir or oak/ponderosa pine forest; may occur in the South Puget and Columbia planning units.
Gray Wolf *Canis lupus*	SE FT	Areas with an ungulate prey base and low levels of human activity; may occur in North Puget, South Puget, and Columbia planning units.
Grizzly Bear *Ursus arctos*	SE FT	Areas with low levels of human activity; may occur in North Puget and South Puget planning units.
Pacific Fisher *Martes pennanti*	SE FCo	Structurally complex forest, especially at low to moderate elevations; may occur in all planning units, although extensive surveys have resulted in no detections (Lewis and Stinson 1998).
Canada Lynx *Lynx canadensis*	ST FT	Subalpine fir vegetation and interspersed patches of other forest types, generally above 4,000 feet elevation (Ruediger et al. 2000); may occur in North Puget, South Puget, and Columbia planning units.
Columbian White-Tailed Deer *Odocoileus virginianus leucurus*	SE FE	Bottomland riparian forests, grassland, and agricultural lands along an 18-mile stretch of the Columbia River.

1/ SE = State Endangered; ST = State Threatened; SS = State Sensitive; FE = Federal Endangered; FT = Federal Threatened; FCo = Federal Species of Concern

2/ Unless otherwise indicated, all distribution and habitat association information is drawn from the HCP.

Table D-8. Estimated Proportion of DNR Westside Trust Lands in Different Forest Habitat Types under Each Alternative

Forest Type	Alternative	2004[1/]	2008	2013	2031	2048	2067
	1	8%	8%	9%	8%	10%	10%
	2	9%	10%	11%	10%	12%	13%
Ecosystem	3	8%	10%	13%	11%	14%	14%
Initiation	4	8%	7%	8%	10%	9%	10%
	5	12%	15%	16%	16%	16%	17%
	6	11%	11%	13%	12%	11%	13%
	1	81%	79%	75%	65%	57%	51%
	2	81%	78%	74%	67%	63%	60%
Competitive	3	81%	78%	73%	67%	63%	62%
Exclusion	4	81%	78%	74%	61%	55%	50%
	5	83%	80%	77%	71%	65%	61%
	6	78%	77%	73%	67%	60%	52%
	1	10%	13%	16%	27%	33%	38%
	2	10%	12%	15%	22%	25%	27%
Structurally	3	10%	12%	15%	22%	24%	24%
Complex	4	11%	14%	19%	29%	36%	39%
	5	5%	5%	6%	13%	19%	22%
	6	11%	12%	14%	21%	28%	35%

Source: DNR alternative modeling output data

1/ Model runs used to estimate the future availability of different forest structure classes under the alternatives were started in 2001 to "clean" the inventory of sales sold between 2001 and 2003. In addition, the models for Alternatives 5 and 6 used a different method than the other alternatives for calculating yield (which was used as the basis for determining forest structure classes). The models for Alternatives 5 and 6 used value-based yield tables, whereas those for Alternatives 1 through 4 were volume-based. These two factors account for the differences in Year 2004 values among the alternatives. Notwithstanding the dissimilar starting points, the differences among the general trends in the rates at which the amount of the forest structure classes change provides a basis for comparing the effects of the alternatives.

Table D-9. OPTIONS Model Estimates of Percent Change from the Current Amount of Spotted Owl Dispersal Habitat under Each Alternative

Alternative	2008	2013	2031	2048	2067
1	+ 2	+ 6	+ 31	+ 41	+ 42
2	+ 1	+ 5	+ 15	+ 18	+ 16
3	+ 1	+ 2	+ 15	+ 17	+ 11
4	+ 5	+ 12	+ 34	+ 44	+ 40
5	+ 1	+ 2	+ 1	+ 13	+ 12
6	+ 5	+ 10	+ 24	+ 48	+ 55

Source: DNR alternative modeling output data

Table D-10. Estimated Percentage of DNR Land within 40 Miles of Marine Waters Comprising Structurally Complex Forest under Each Alternative

Alternative	2008	2013	2031	2048	2067
1	11%	13%	17%	28%	33%
2	11%	13%	16%	23%	25%
3	11%	12%	15%	23%	24%
4	11%	15%	19%	29%	35%
5	5%	6%	7%	13%	20%
6	11%	12%	14%	20%	28%

Source: DNR alternative modeling output data

Table D-11. Estimated Proportion of Low-elevation[1/] DNR Westside Trust Lands Comprising Structurally Complex Forest under Each Alternative, Compared to the Estimated Proportion on DNR Westside Trust Lands Overall

	Low-elevation					Overall				
Alternative	2008	2013	2031	2048	2067	2008	2013	2031	2048	2067
1	10%	12%	16%	28%	33%	13%	16%	27%	33%	38%
2	10%	12%	15%	23%	25%	12%	15%	22%	25%	27%
3	10%	12%	15%	23%	24%	12%	15%	22%	24%	24%
4	10%	14%	19%	30%	36%	14%	19%	29%	36%	39%
5	4%	5%	6%	12%	19%	5%	6%	13%	19%	22%
6	10%	12%	13%	21%	28%	12%	14%	21%	28%	35%

Source: DNR alternative modeling output data

1/ Defined as Watershed Administrative Units where at least 50% of DNR land is in the Western Hemlock or Sitka Spruce vegetation zones.

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D.5 LIST OF SURFACE WATER SEGMENTS

As of 1998, segments of the following surface waters were included in the 303(d) list prepared by the Washington Department of Ecology because pollutants impair beneficial uses of these waters (Department of Ecology, 2003).

Abernathy Creek
Alder Creek
Allen Creek
Anderson Creek
Bagley Creek
Baird Creek
Barker Creek
Bear Creek
Bear Creek
Beaver Creek
Bertrand Creek
Berwick Creek
Big Beef Creek
Big Quilcene River
Big Soos Creek
Black Creek
Blackjack Creek
Bogachiel River
Boulder Creek
Boyce Creek
Burley Creek
Burnt Bridge Creek
Campbell Creek
Canyon Creek
Carpenter Creek
Cassalery Creek
Cavanaugh Creek
Cedar River
Chambers Creek
Chehalis River
Chimacum Creek
Church Creek
Cispus River
Clallam River
Clarks Creek
Clear Creek
Clearwater River
Clover Creek
Coal Creek
Columbia River
Cornell Creek
Cougar Canyon
Coweman River
Cowlitz River
Crisp Creek
Cumberland Creek
Curtin Creek
Day Creek
Deep Creek
Deer Creek
Dempsey Creek
Des Moines Creek
Deschutes River
Dillenbaugh Creek
Dry Creek
Dungeness River
Duwamish Waterway
East Canyon Creek
East Fork Dickey River
East Fork Lewis River
East Fork Nookachamps Creek
East Fork North River
East Fork Wildcat Creek
Eaton Creek
Elk Creek
Elkhorn Creek
Elochoman River
Elwha River
Evans Creek
Fifth Plain Creek
Finney Creek
Fishtrap Creek
Fork Creek
Fox Creek
French Creek
Friday Creek

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Gaddis Creek
Gale Creek
Gallop Creek
Germany Creek
Goldborough Creek
Gorst Creek
Grandy Creek
Green Creek
Greenwater River
Hansen Creek
Harrington Creek
Harvey Creek
Hat Slough
Hatchery Creek
Honey Dew Creek
Howard Creek
Huge Creek
Humptulips River
Hylebos Creek
Indian Creek
Issaquah Creek
Jackman Creek
Jackson Creek
Jenkins Creek
Jim Creek
Joe Creek
Johnson Creek
Kalaloch Creek
Kalama River
Kennedy Creek
Kings Creek
Lacamas Creek
Leland Creek
Lincoln Creek
Little Deer Creek
Little Hoko River
Little Quilcene River
Little Soos Creek
Lockwood Creek
Lummi River
Lyon Creek
Mannser Creek
Maple Creek
Marple Creek
Matney Creek
Matriotti Creek
Maxfield Creek
May Creek
McAleer Creek
McAllister Creek
McClane Creek
McCormick Creek
Mercer Slough
Middle Fork Dickey River
Middle Fork Nooksack River
Middle Fork Quilceda Creek
Mill Creek
Minter Creek
Morey Creek
Muck Creek
Mulholland Creek
Naselle River
Newaukum Creek
Nisqually River
Nolan Creek
Nookachamps Creek
Nooksack River
North Creek
North Fork Cispus River
North Fork Clover Creek
North Fork Crooked Creek
North Fork Goble Creek
North Fork Issaquah Creek
North Fork Nooksack River
North Fork Sekiu River
North Fork Skokomish River
North Fork Stillaguamish River
North River
Owl Creek
Panther Creek
Pepin Creek
Perry Creek
Pigeon Creek
Pilchuck Creek
Portage Creek
Purdy Creek

Puyallup River
Quilceda Creek
Rabbit Creek
Racehorse Creek
Raging River
Rattlesnake Creek
Reichel Creek
Ripley Creek
Roaring Creek
Rock Creek
Salmon Creek
Salzer Creek
Samish River
Sammamish River
Scatter Creek
Schneider Creek
Sekiu River
Shanghai Creek
Shelton Creek
Shoofly Creek
Silver Creek
Simons Creek
Skagit River
Skokomish River
Skookum Creek
Skookumchuck River
Skykomish River
Smith Creek
Snohomish River
Snoqualmie River
Soleduck River
Sorenson Creek
South Fork Dakota Creek
South Fork Hoh River
South Fork Nooksack River
South Fork Sekiu River
South Fork Skagit River
South Fork Snoqualmie River
South Fork Stillaguamish River
South Prairie Creek
Sponenbergh Creek
Squaw Creek
Squire Creek
Stavis Creek
Stevens Creek
Stickney Slough
Stillaguamish River
Stimson Creek
Sumas River
Swamp Creek
Swan Creek
Tarboo Creek
Thorndike Creek
Thornton Creek
Tibbetts Creek
Tower Creek
Turner Creek
Union River
Voight Creek
Wapato Creek
Weaver Creek
West Branch Big Soos Creek
West Fork Dickey River
West Fork Woods Creek
Whatcom Creek
White River
White Salmon River
Wiley Slough
Wilkeson Creek
Willapa River
Willoughby Creek
Winfield Creek
Woodland Creek
Woods Creek
Woodward Creek
Wynoochee River
Yacolt Creek

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D.6 POTENTIAL EFFECTS OF THE PROPOSED ALTERNATIVES ON SEDIMENT DELIVERY

The amount of sediment that reaches a stream depends primarily on two processes: the availability of sediment and the ability of sediment to travel from its source to the stream. Sediment is produced through mass wasting and surface erosion, as described in Section 4.6, Geomorphology, Soils and Sediment, and in Section 4.15, Cumulative Effects. Mass wasting is not expected to increase as a result of implementation of any of the alternatives; however, increased harvest would increase the risk of surface erosion from road use and other harvest-related activities.

The ability of sediment to travel from its source to streams could be affected through changes in harvest in riparian areas. In general, the vegetation in riparian areas serves as a filter, removing sediment before it reaches a water body. In most cases, vegetation immediately adjacent to a stream channel is most important in maintaining bank integrity (Forest Ecosystem Management Assessment Team 1993). Protection of stream bank integrity, and adequate soil filtering of surface erosion is generally maintained with a fully functioning stand within 30 feet of a stream. Other than restoration activities, roads, and yarding corridors, none of the alternatives proposes activities within the 25-foot no-harvest zone. The adjoining 75 feet is the minimal-harvest zone that would include restricted activities that vary between Alternatives. This level of Riparian Management Zone protection reduces the differences in sediment delivery between alternatives.

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D.7 ARCHAEOLOGICAL OVERVIEW OF WESTERN WASHINGTON

The first human occupation of the state of Washington may date back about 14,000 years to the Manis Mastodon site at Sequim, where a possible bone point and the spirally fractured bones of an extinct relative of the elephant indicate possible human hunting and butchering. (Date given here are in calendric years, based on approximate calibration of radiocarbon ages.) Artifacts of the Clovis culture, which dates between 13,000 and 13,500 years ago elsewhere in North America, have been found on the ground surface in such places as Thurston County and Whidbey Island, but no campsite of this culture has yet been found in Washington. This early culture is generally believed to have relied heavily on big game for subsistence, although there is evidence they consumed a more diverse diet that also included plants and smaller animals.

The post-Clovis prehistory of western Washington has been divided into three periods, designated simply as early, middle, and late. The early period, which lasted from approximately 12,000 to 7,000 years ago, includes the Proto-Western and Old Cordilleran Traditions (Matson and Copeland 1995). (Old Cordilleran is called "Olcott" in the Puget Sound and Straits Planning Units, and Cascade in the Columbia Planning Unit and at other high mountain sites where a greater likeness is seen to cultures east of the Cascades.) Sites left by these traditions typically occur on high marine and river terraces, sometimes at a significant distance from modern water courses, and consist of concentrations of cobble cores, flakes, large ovate knives, and broad-stemmed and leaf-shaped projectile points (Wessen 1990). Sites of both traditions occur near the saltwater coastline and larger river valleys in all planning units. In the South Puget, Straits, and Columbia Planning Uunits, they also have been documented along mountain streams in open sites, rockshelters, and caves (Wessen and Stilson 1986, Lewarch and Benson 1989). Because of an apparent inland focus, the people of this era are thought to have been more oriented to land animal hunting and less to marine and fish resources. Finds at nearby sites in British Columbia, northern Oregon, and eastern Washington, however, show that people also exploited aquatic resources during this early time period.

The middle period, lasting from 7,000 to 3,500 years ago sees a continuation of the Old Cordilleran Tradition until around 4,500 years ago, but few sites can be attributed to this time interval (Morgan 1999). Sites dating after 4,500 are more common and technologically more complex. The focus of subsistence activity seems to have changed from terrestrial to marine resources and most sites appear along the coasts or major river systems. The oldest shell midden sites thus far found in the region date to this period. Little evidence of activity is found in the higher mountains. Tools are more complex, including tools and ornaments of bone and antler along with chipped stone. On the basis of work at West Point, one of the few well-studied sites of this era, the lifestyle is interpreted as highly mobile and oriented to foraging for seasonally available foods with little emphasis on mass harvesting or food storage (Larson and Lewarch 1995).

The concentration on aquatic resources intensified during the Late Period (3,500 to 150 years ago), and the number and diversity of sites increased markedly. People maintained permanent villages on the coast and along the lower reaches of inland rivers. They used these villages as home bases and storage warehouses for food amassed during systematic

fish, game, and plant harvesting throughout the warm seasons. Huge shell middens were built up at some villages and at the best clam beaches. Cemeteries and petroglyph sites are often associated with village and midden sites and fishing camps and occur occasionally in higher montane settings. Blazed cedars, stripped of bark for basketry or with planks removed from their living trunks, can still be found throughout the lowlands. Small open camps left by hunters, fishers, plant gatherers, and traders have been found from the lowlands well into the sub alpine zone of the mountains, but usually remain close to larger, permanent sources of water. The camps typically are concentrated along trade routes that linked communities living east and west of the Cascades. People usually strayed from larger streams and lakes only in the larger prairies of the lowlands, such as those around Fort Lewis and Sequim (e.g., Morgan 1999), in the huckleberry fields of the uplands, and near natural outcroppings of favored tool stone. Open, temporary camps, manifest as lithic scatters, are common in these settings. Extensive evidence of late period huckleberry processing has been documented in the sub alpine forests of the Columbia Planning Unit, where they occur as shallow, charcoal-filled trenches (Mack and McClure 2002). Ethnographic reports indicate such sites should also be expected to occur in the South Puget Sound Planning Unit (Larson 1988).

D.7.1 Ethnographic Overview of Western Washington

Historic native cultures of the region can generally be seen as a continuation of the lifeways indicated by late period archaeological sites. The people of this region belonged to five linguistic groups: Wakashan, Salishan, Chimakuan, Chinookan, and Sahaptian. Wakashan, Chinookan, Chimakuan, and most Salishan peoples were marine oriented, occupying villages on the major rivers or saltwater shorelines and focusing on shellfish and salmon and/or saltwater fish for their subsistence (Schalk 1988). These peoples abandoned their villages in summer, moving among fishing sites, and hunting, root gathering, and berrying camps in mountains and prairies (Haeberlin and Gunther 1930). The Salishan Snoqualmie and the Sahaptian-speaking Klikitat differed, spending most of their time in foothill and mountain settings, where they emphasized hunting, berrying and root gathering, and served as intermediaries in the transmontane trade.

For all groups, forests provided many raw materials, including bark for baskets, planks for housing, and plants for medical uses, as well as subsistence resources (Gunther 1973). To maintain game and berry supplies, people regularly fired prairies and sub alpine forests to keep plant communities at earlier successional stages. Forests also provided solitude that was necessary for individuals' quests for personal spirit helpers. This quest for spiritual guidance began at around puberty and continued throughout a person's life (Haeberlin and Gunther 1930).

Today, Indian tribes maintain a strong interest in Washington's upland forests, exercising rights guaranteed by treaty (Table D-12). Their members continue to fish at usual and accustomed places, hunt big game, and collect berries, bark, and medicinal plants. Some tribal people maintain the tradition of fasting for spiritual guidance and so continue to require the solitude of older, isolated forest lands. Tribes hold many landscape features to be sacred or at least important to the continued practice of their traditional cultures.

Table D-12. Major Tribes Associated with the Planning Units in Western Washington

Planning Unit	Major Tribes
Columbia	Chinook, Yakama
South Coast	Shoalwater Bay Chinook, Chehalis, Quinault
Straits	Makah, Lower Elwah, Jamestown, Port Gamble S'Klallum
Olympic Experimental State Forest	Makah, Quileute, Hoh, Quinault, S'Klallum groups
North Puget	Nooksack, Lummi, Swinomish, SaukSuiattle, Stillaguamish, Tulalip, Muckleshoot
South Puget	Suquamish, Muckleshoot, Puyallup, Nisqually, Squaxin Island, Skokomish

D.7.2 Overview of Regional History

Washington's coastline was first charted and described by English and American Explorers in the last decades of the eighteenth century. Fur traders, primarily associated with Hudson's Bay Company posts at Vancouver and Nisqually, traveled into the interior in the first half of the nineteenth century. Except for the increasing presence of beads, metal, and other trade goods among the Local Indian tribes, however, they left few traces outside their fort compounds. By the 1830s, the Hudson's Bay Company had expanded into agricultural production, maintaining large farms in the lowlands around Forts Vancouver and Nisqually and in the lower Cowlitz. Settlers, some drawn by the promise of farmland, but most coming to exploit the region's timber and mineral wealth began flowing into the lowlands of the South Puget and Columbia Planning Units by the late 1840s. In the upland areas that include most of DNR forest lands, their principal interests were coal and timber (Avery 1965).

Mining has left its traces throughout the uplands of western Washington. Although the Cascade Mountains contain a variety of gems and minerals, their most abundant mineral resource is coal. Coal was discovered in the vicinity of Seattle in 1853 and, by the early 1860s, veins had been documented in the Cascade Foothills of the North and South Puget planning units from Bellingham Bay to Olympia. In addition to large, open pit mines and haul roads, traces of past mining occur as mining prospects, mine shafts, and miners' camps.

Timber has always been the premier natural resource of the region and continues to be the focus of resource management on state lands. When the region's timber industry began in the 1850s, loggers first focused on large trees close to coastlines and the banks of larger streams, which enabled them to float logs to lumber mills. Once this easily extracted timber had been cut, loggers used teams of oxen to haul logs to water along wooden skid roads. Such roads can still be found in boggy soils along streams, where the moisture and soil acidity have preserved them. By the 1880s, steam engines, including locomotives and steam donkeys, came into use and logs were transported on flatcars that ran on wooden rails. By the beginning of the 20th century, most of the timber in lowland and foothill settings had been cut and operations moved into higher mountains, using

locomotives on steel rails and later trucks on logging roads to extract their product (Avery 1965).

In addition to skid roads, sites associated with logging include railroad grades and tracks, trestles, construction and logging camps, stumps cut with springboard notches, and a variety of equipment. It is a paradox of the long-term planning process that in some plots with a long duration between harvests, artifacts and structures left by the loggers who make the first harvest will be more than 50 years old and thus potential cultural resources before the second harvest is made.

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